Proceedings for the 29th International Seating Symposium

29th ISS International Seating Symposium

Building the Future

March 7-9, 2013

Department of Rehabilitation Science and Technology
Continuing Education
School of Health and Rehabilitation Sciences
University of Pittsburgh

Course Director: **Mark R. Schmeler, PhD, OTR/L, ATP**

In Collaboration with:

- **Sunny Hill Health Centre for Children,** University of British Columbia
- **European Seating Symposium**
- **Users First Alliance**
- **Department of Rehabilitation Science and Technology,**
  School of Health and Rehabilitation Sciences, University of Pittsburgh
- **Pittsburgh VA Rehabilitation Research and Development Center of Excellence -**
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Faculty

A

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IC38 – Friday – 9:30 AM
Let's Get the Show on the Road: Integrating Life Support with Mobility Systems

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IC73 – Saturday – 9:30 AM
Functional Mobility for the Geriatric Population - The Meat and Potatoes

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

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IC33 – Friday – 9:30 AM
Does My Evaluation Provide Enough Documentation to Get the Product Funded?

B

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

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IC66 – Saturday – 8:00 AM
Biomechanics and Its Application to Seating

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PS10.3 – Saturday – 9:30 AM
Measuring Seated Posture: The Seated Posture Scale

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PS8.2 – Friday – 3:00 PM
Implementing the FEW into Everyday Best Practices

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PC7 – Wednesday – 8:00 AM
Manual Wheelchair Selection, Configuration and Training

IC40 – Friday – 9:30 AM
Power Assist: Fundamentals of Programming and Applications for Successful Operation

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PC8 – Wednesday – 8:00 AM
Work Hard, Play Hard: Get Hands-On with Adaptive Sports and Recreation Technologies

SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

IC75 – Saturday – 9:30 AM
Service Dogs for People with Mobility Impairment

Jim Black M
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SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

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PC8 – Wednesday – 8:00 AM
Work Hard, Play Hard: Get Hands-On with Adaptive Sports and Recreation Technologies

IC56 – Friday – 3:00 PM
Put Me In, Coach, I'm Ready!

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IC16 – Thursday – 2:30 PM
Introduction to the Wheelchair Clinic: An Interactive LIVE Assessment!

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IC03 – Thursday – 1:00 PM
A Systematic Approach to Alternative Drive Control Assessments

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IC23 – Thursday – 4:00 PM
Why We Do the Things We Do? Transfer of Learning to Clinical Practice

PS6.4 – Friday – 11:00 AM
Staying on Track - Evaluating the Efficacy of Power Wheelchair Tracking

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PS8.3 – Friday – 3:00 PM
Functional Mobility Outcomes of Individuals Receiving a New Seating Device

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IC64 – Saturday – 8:00 AM
Man vs. Chair! Who Wins In The Challenge Of Mobility?

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IC62 – Friday – 3:00 PM
Training Consumers for the Skills of Wheelchair Transportation Safety

C

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PO – Thursday – 11:30 AM
Pelvic Total Support and Trunk Total Support Groundbreaking Approach to Posture

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IC18 – Thursday – 4:00 PM
Evidence-Based Guidelines for IPM: Final Research Findings

IC63 – Saturday – 8:00 AM
Foamology 101

Susan Calyer, OTR/L, ATP, CAPS
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IC69 – Saturday – 8:00 AM
ALS and Therapy Interventions

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PS8.4 – Friday – 3:00 PM
Translation of the Functional Mobility Assessment into Portuguese for Brazilian Health Professionals

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PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

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PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

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IC28 – Friday – 8:00 AM
An Update on the Separate Benefit for Complex Rehab Technology Under Medicare

IC52 – Friday – 1:30 PM
Do the Coverage Criteria Match My Client's Functional Needs?

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IC51 – Friday – 1:30 PM
Why, When and How to Introduce Self-Mobility in Young Children

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SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

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PS3.4 – Thursday – 4:00 PM
Ultra-light Manual Wheelchair Prescription Pattern - Can It Be Influenced?

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PC3 – Tuesday – 8:00 AM
Measuring Wheelchair Seated Posture and Seating Supports: A Practicum

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PS7.4 – Friday – 1:30 PM
Procedures for Identifying and Managing Wheelchair and Seating Repairs

D

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IC27 – Friday – 8:00 AM
24/7 Pressure Management in the Acute Rehab Setting

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PS9.1 – Saturday – 8:00 AM
The Use of Tilt-in-Space in Seating Systems

PS9.2 – Saturday – 8:20 AM
The Effectiveness of Specialist Seating Provision for Nursing Home Residents

Kimberly A. Davis, MSPT, ATP
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IC18 – Thursday – 4:00 PM
Evidence-Based Guidelines for IPM: Final Research Findings

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PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

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PC7 – Wednesday – 8:00 AM
Manual Wheelchair Selection, Configuration and Training

IC45 – Friday – 11:00 AM
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IC70 – Saturday – 9:30 AM
Ethics and Certification: An Update on Raising the Bar of Professionalism

Jay Doherty, OTR, ATP/SMS M
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IC39 – Friday – 9:30 AM
Freedom: An Overview of the Functional & Therapeutic Benefits of Dynamic Seating

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PO – Thursday – 11:30 AM
Managing Surfaces to Reduce Hospital-Acquired Infections

IC29 – Friday – 8:00 AM
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PS5.1 – Friday – 9:30 AM
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E

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IC11 – Thursday – 2:30 PM
Consumer Organization Leaders Share Insights of a Sustainable Consumer Movement - A Panel Discussion

IC49 – Friday – 1:30 PM
Enhancing Your Practice Through Sustained Consumer Engagement

F

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IC67 – Saturday – 8:00 AM
The Benefits of Gait Training

Kathryn J. Fisher, B.Sc. (OT), ATP
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IC54 – Friday – 1:30 PM
Creativity: Does It Still Have a Place in Rehab?

Jane E. Fontein, OT
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IC26 – Friday – 8:00 AM
Tissue Trauma… Tilt in Space… Surfaces...

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IC06 – Thursday – 1:00 PM
Unsafe at Many Speeds - A Team Approach for a Safer Ride

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SS1.2 – Thursday – 9:20 AM
Training in Wheelchair Provision: Propelling Forward a Universal Standard

IC12 – Thursday – 2:30 PM
World Health Organization Wheelchair Service Training Package

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PO – Thursday – 11:30 AM
How to Conduct a Wheelchair Seated Posture Survey Using ISO-Based "Rysis"

G

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SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

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IC47 – Friday – 11:00 AM
Telerehab for Self-Management of Lower Limb Swelling in Wheelchair Users

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PS3.2 – Thursday – 4:00 PM
Increasing AT and Interprofessional Online Training

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PS9.4 – Saturday – 8:00 AM
Development of a Wheelchair Mounted Robotic Device for Assisting with Transfers

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IC07 – Thursday – 1:00 PM
Does the Evidence Exist for a Wheelchair Skills Training Program?

IC25 – Friday – 8:00 AM
Research is a Necessary Evil

PS10.4 – Saturday – 9:30 AM
Predictors of Falls from Wheelchairs

Ricardo Guzman
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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

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IC19 – Thursday – 4:00 PM
Integrating Research into Practice Using the Functional Mobility Assessment

Simon Hall
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IC44 – Friday – 11:00 AM
Seating for the Complex Child: Why Does it Have to be So Complex?

SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

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IC02 – Thursday – 1:00 PM
Analyzing Pressure Ulcer Clinical Practice Guidelines Regarding Seating

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PO – Thursday – 11:30 AM
Refined Landmarks and Their Assessment for Seated Posture Measurement

PS1.4 – Thursday – 1:00 PM
Development and Evaluation of New Versions of Seated Posture Measurement Tools

Wayne H. Hanson M
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PS5.3 – Friday – 9:30 AM
Helping Wheelchair Users be Pro-Active with their Seating System

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IC10 – Thursday – 2:30 PM
Posture and Postural Tendencies: What's the Difference?

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PS1.1 – Thursday – 1:00 PM
Evaluation of a Physical Activity Monitoring System for Manual Wheelchair Users

Hideyuki Hirose, PhD, PT
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PO – Thursday – 11:30 AM
Development of a Wheelchair Repeated Test Simulating Caster-Up Handling by an Attendant

Helen M. Hoenig, MD, MPH
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PS7.2 – Friday – 1:30 PM
Effects of Wheelchair Type & Task on Mobility Performance: Speed and Collisions

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PS3.1 – Thursday – 4:00 PM
A Consolidated Model of Clinical Seating Services

Rita Hostak M
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PC4 – Wednesday – 8:00 AM
Policy, Funding, and the “Science” of Policy and Reimbursement

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PO – Thursday – 11:30 AM
Is Power or Manual the Mobility Choice for Those with Mid-to-Low Cervical SCI?

J

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IC08 – Thursday – 1:00 PM
Considerations for Bowel, Bladder and Bathing Management after SCI

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PC1 – Tuesday – 8:00 AM
Aging with a Disability: Evaluation, Clinical and Research Perspectives

K

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IC65 – Saturday – 8:00 AM
Focus Group on Developing a new Power Wheelchair Driving Skills Assessment

Karen M. Kangas, OTR/L, ATP
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IC30 – Friday – 8:00 AM
Configuring Powered Mobility Systems for the First Time User

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

IC12 – Thursday – 2:30 PM
World Health Organization Wheelchair Service Training Package

SS1.2 – Thursday – 9:20 AM
Training in Wheelchair Provision: Propelling Forward a Universal Standard

Martin Kilbane, PT, OCS
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PC7 – Wednesday – 8:00 AM
Manual Wheelchair Selection, Configuration and Training

Chad Kincaid, PT, CP
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PC8 – Wednesday – 8:00 AM
Work Hard, Play Hard: Get Hands-On with Adaptive Sports and Recreation Technologies

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IC07 – Thursday – 1:00 PM
Does the Evidence Exist for a Wheelchair Skills Training Program?

IC17 – Thursday – 4:00 PM
The Wheelchair Skills Program and the WHO Guidelines on Wheelchair Provision

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IC36 – Friday – 9:30 AM
Know, Go, Grow - Pediatric Mobility Bases and Designs for Independent Mobility

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IC21 – Thursday – 4:00 PM
Improving Patient Experience and Outcome: A Service Delivery Model Approach

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PC1 – Tuesday – 8:00 AM
Aging with a Disability: Evaluation, Clinical and Research Perspectives

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PS2.2 – Thursday – 2:30 PM
Inflammation in Individuals with SCI with Pneumonia and Pressure Ulcer Incidence

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

L

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PC6 – Wednesday – 8:00 AM
Advanced Power Wheelchair Applications

PS6.4 – Friday – 11:00 AM
Staying on Track - Evaluating the Efficacy of Power Wheelchair Tracking

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IC50 – Friday – 1:30 PM
That's Just Wrong - Using Seating Disasters to Improve Future Prescriptions

IC60 – Friday – 3:00 PM
The Mat Assessment - It's Not All or Nothing

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PS1.3 – Thursday – 1:00 PM
Investigating Activity-Related Sonographic Change in Wheelchair Users' Shoulders

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PO – Thursday – 11:30 AM
Adaptive Seating Facilitates Activity and Participation

M

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IC01 – Thursday – 1:00 PM
Ethics for All

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PS4.4 – Friday – 8:00 AM
Assistive Technology, Occupation, Indpendence and Poverty

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

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PS10.2: Saturday – 9:30 AM
Beyond the "Support Group": Empowering
People with SCI Through Networking.

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PS2.1 – Thursday – 2:30 PM
The Effect of Optimal Positioning for Pressure
Relief in Functional Activities

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IC05 – Thursday – 1:00 PM
Ultralight Manual Wheelchairs: Get it Right, Get it Covered

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IC68 – Saturday – 8:00 AM
An Activity-Based Restorative Therapy
Approach to Wheelchair Prescription

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PC1 – Tuesday – 8:00 AM
Aging with a Disability: Evaluation, Clinical and Research Perspectives

PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

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IC42 – Friday – 11:00 AM
A Programmatic and Pragmatic Approach to
Providing Power Mobility for People with ALS

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IC76 – Saturday – 9:30 AM
Back it Up! Basics of Back Supports

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IC32 – Friday – 8:00 AM
Clinical Applications for Power Wheelchair Platforms

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PO – Thursday – 11:30 AM
Comfort and Function for Children with Cerebral
Palsy: The CASPER Approach

N

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PC8 – Wednesday – 8:00 AM
Work Hard, Play Hard: Get Hands-On with Adaptive
Sports and Recreation Technologies

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PO – Thursday – 11:30 AM
Comparison of Perceived Comfort with Pressure Distribution of ROHO PostureLITE

O

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PS4.3 – Friday – 8:00 AM
Manual Wheelchair User Activity Classification in Natural Environments

P

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IC04 – Thursday – 1:00 PM
Wheelchair Clinics: Design & Structure

PS9.3 – Saturday – 8:00 AM
Where's My Wheelchair?

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IC34 – Friday – 9:30 AM
Dosing for Pediatric Standing Programs: A Systematic Review

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IC24 – Thursday – 4:00 PM
How to Select a Proper Stander for Children with Disabilities

IC37 – Friday – 9:30 AM
Thinking Outside of the Box: If I Cannot Find It, I Will Make It

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IC53 – Friday – 1:30 PM
The Role of Friction and Shear Forces in Pressure Ulcer Generation

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PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

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PO – Thursday – 11:30 AM
Positioning for Children with Significant Functional Decline in their Lifespan

PS5.4 – Friday – 9:30 AM
Seating and Positioning for Children with Rett Syndrome

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IC46 – Friday – 11:00 AM
Wheelchair Configuration as it Relates to Transportation and the Driving Task

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PS10.1 – Saturday – 9:30 AM
Review of Wheelchair Provision in the VA for Veterans with Amputations

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PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

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PC9 – Wednesday – 8:00 AM
The Chair and Beyond: Choosing and Documenting Equipment for Children

IC22 – Thursday – 4:00 PM
The Relationship Between Vision, Posture and Mobility

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IC74 – Saturday – 9:30 AM
Kinesio® Tape: Case Studies for Use as a Dynamic Postural Support

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PS3.3 – Thursday – 4:00 PM
Specialized Clinical Affiliation in Seating and Mobility

Sharon L. Pratt, PT
Seating Solutions, LLC
Longmont, CO
United States
sharronpra@msn.com

IC61 – Friday – 3:00 PM
Posture and How it Develops: Standing & Sitting Considerations for the Young Child

IC63 – Saturday – 8:00 AM
Foamology 101

Deborah L. Pucci, PT, MPT
Rehabilitation Institute of Chicago
Chicago, IL
United States
dpucci@ric.org

IC58 – Friday – 3:00 PM
Comparing the Tongue Drive to Standard Methods of Assistive Technology Control

R

Laura A. Rice, PhD, MPT, ATP
University Of Illinois Urbana Champaign
Champaign, IL
United States
ricela@illinois.edu

PS6.3 – Friday – 11:00 AM
Use of an Environmental Control Unit by a Power Wheelchair User in Higher Education

Ian M. Rice, PhD, MOT
University Of Illinois Urbana Champaign
Champaign, IL
United States
ianrice@illinois.edu

PS7.3 – Friday – 1:30 PM
Effects of Wheelchair Configuration on Manual Wheelchair Propulsion Training

Karen Rispin
LeToutneau University
Longview, TX
United States
karenrispin@letu.edu

PS8.1 – Friday – 3:00 PM
A Modification of the Functional Mobility Assessment for School Children

Tina L. Roesler, PT, MS, ABDA M
TiLite
Pasco, WA
United States
troesler@tilite.com

PC7 – Wednesday – 8:00 AM
Manual Wheelchair Selection, Configuration and Training

IC13 – Thursday – 2:30 PM
Following Through: Assessment and Training after Wheelchair Delivery

Lauren Rosen, PT, MPT, MSMS, ATP/SMS
St. Joseph's Children's Hospital of Tampa
Tampa, FL
United States
PTLauren@aol.com

IC35 – Friday – 9:30 AM
Stop, Look and Listen!

PS7.1 – Friday – 1:30 PM
Pediatric Manual Wheelchair Propulsion and its Differences from Adult Populations

IC57 – Friday – 3:00 PM
Pediatric Manual Mobility - Seating Children for Function

Craig Rowitz, MPT, ATP
Care Medical
Cincinnati, OH
United States
craig@caremedicalonline.com

IC48 – Friday – 11:00 AM
Prone and Standing PWC Driving Positions:
Mock Ups, Trials and Outcomes

S

Andrina J. Sabet, PT, ATP
Cleveland Clinic Children's Hospital for Rehabilitation
Cleveland, OH
United States
asabet@gmx.com

IC35 – Friday – 9:30 AM
Stop, Look and Listen!

Leslie Samuelson, OTR/L, ATP
Veterans Health Administration
ainesville, FL
United States
Leslie.Samuelson@va.gov

SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

Andi Saptono, PhD
University of Pittsburgh
Pittsburgh, PA
United States
ans38@pitt.edu

SS1.3 – Thursday – 8:30 AM
Development of an Outcomes Management System for Mobility

Richard M. Schein, PhD, MPH
University of Pittsburgh
Pittsburgh, PA
United States
rms35@pitt.edu

SS1.3 – Thursday – 8:30 AM
Development of an Outcomes Management System for Mobility

Rachel M. Schofield, O.T BSc Hons
University of Ulster
Jordanstown Co Antrim
United Kingdom
schofield-r@email.ulster.ac.uk

PS2.4 – Thursday – 2:30 PM
Spinal Cord Injury and Interface Pressure

Mary Shea MA, OTR, ATP
Kessler Institute for Rehabilitation
West Orange, NJ
United States
mshea@kessler-rehab.com

PC1 – Tuesday – 8:00 AM
Aging with a Disability: Evaluation, Clinical
and Research Perspectives

Allen R Siekman
Allen Siekman Consulting
Ben Lomond, CA
United States
allen@ebold.com

PC2 – Tuesday – 8:00 am
Principles of Postural Control and Tissue Trauma Prevention

PS6.2 – Friday – 11:00 AM
The Influence of Belt Use on Reach and Push
Function in Active Wheelchair Users

James Stephenson M
Invacare
Elyria, OH
United States
jstephenson@invacare.com

PC4 – Wednesday – 8:00 AM
Policy, Funding, and the "Science" of Policy and Reimbursement

Bryce S. Sutton, PhD
James A. Haley VA Medical Center
Tampa, FL
United States
Bryce.Sutton@va.gov

IC09 – Thursday – 2:30 PM
An Introduction to Economic Evaluation of Health Care Interventions

T

Melissa K. Tally, PT, MPT, ATP
Perlman Center, Cincinnati Children's Hospital and Medical Center
Cincinnati, OH
United States
melissa.tally@cchmc.org

IC41 – Friday – 11:00 AM
Functional Positioning for Preschoolers and
Beyond: Complex Conditions

Stephanie A. Tanguay, OTR, ATP M
Motion Concepts
Tonawanda, NY
United States
stephanie_tanguay@yahoo.com

IC15 – Thursday – 2:30 PM
Back Support: Keystone to Seated Function and Physiology

Erika Teixeira, MOT
Private Practice
Sao Paulo
Brazil
rika.teixeira@yahoo.com.br

PS4.2 – Friday – 8:00 AM
Assistive Technology and the ICF as a Concept: A Case Study

Diane B. Thomson, MS, OTR/L, ATP
Rehabilitation Institute of Michigan
Detroit, MI
United States
dthomson2@dmc.org

IC14 – Thursday – 2:30 PM
Hindsight is 20/20: How the Past Can Enhance the Future of Wheelchair Seating

Maria L. Toro Hernandez, MS
University of Pittsburgh
Pittsburgh, PA
United States
mlt47@pitt.edu

PC5 – Wednesday – 8:00 AM
Wheelchair Provision in Less-Resourced Settings

PS4.1 – Friday – 8:00 AM
4R Model for Increasing Wheelchair LIfecycles in Less Resourced Settings

Chung-Ying Tsai, PT
University of Pittsburgh
Pittsburgh, PA
United States
cht60@pitt.edu

PS1.2 – Thursday – 1:00 PM
Refinement and Psychometric Reassessment of the Transfer Assessment Instrument

Patricia E. Tully, OTR, ATP
TIRR
Houston, TX
United States
patricia.tully@memorialhermann.org

IC23 – Thursday – 4:00 PM
Why We Do the Things We Do? Transfer of Learning to Clinical Practice

Yi-Ting Tzen, PhD
University of Pittsburgh
Pittsburgh, PA
United States
yit10@pitt.edu

PS2.3 – Thursday – 2:30 PM
Relative Effect of Pressure, Temperature and Shear on Non-Damaging Tissue Ischemia

U

Sachie Uyama, PT
Tottori Perfecture Child Development Support Division
Tottori
Japan
sauyama@cure.ocn.ne.jp

PO – Thursday – 11:30 AM
Seating Arrangements for Children with Insufficient Head Control

V

Bart A. Van Der Heyden, PT
The Roho Group Europe Destelbergen
Belgium
bvanderheyden@attglobal.net

IC31 – Friday – 8:00 AM
The Impact of Lower Extremities on the Posture of Wheelchair Users

W

Virginia Walls, PT, MS, NCS, ATP, SMS
Medstar National Rehabilitation Network
Washington, DC
United States
virginia.st.walls@medstar.net

IC71 – Saturday – 9:30 AM
Clinical Needs and Product Applications for Bariatric Clients of All Sizes

Hongwu Wang, PhD
University of Pittsburgh
Pittsburgh, PA
United States
how11@pitt.edu

PS6.1 – Friday – 11:00AM
Power Wheelchair Driving Outdoors: Problems and Strategies

Kelly G. Waugh, PT, MAPT, ATP
Assistive Technology Partners
Denver, CO
United States
kelly.waugh@ucdenver.edu

PC3 – Tuesday – 8:00 AM
Measuring Wheelchair Seated Posture and Seating Supports: A Practicum

IC72 – Saturday – 9:30 AM
Custom Contoured Seating: Ensuring Successful Outcomes

Laura S. Wehrli, PT, DPT, ATP

Craig Hospital
Englewood, CO
United States
LWehrli@craighospital.org

IC20 – Thursday – 4:00 PM
Aligning Expectations for 21st Century Rehabilitation

Nicole S. Wilkins, OT

Sunny Hill Health Centre For Children
Vancouver, BC
Canada
nwilkins@cw.bc.ca

IC55 – Friday – 1:30 PM
Get Smart with SMA: Positioning & Power Mobility
Set- Ups for Clients with Spinal Muscular Atrophy

Karen L. Wills, OTR/L

State of Tennessee Division of Intellectual Disabilities
Old Hickory, TN
United States
karen.wills@tn.gov

PS5.2 – Friday – 9:30 AM
The Use of Custom Bed Positioning for People
with Severe Physical Disabilities

Lynn Worobey

University of Pittsburgh
Pittsburgh, PA
United States
law93@pitt.edu

SS2.2 – Thursday – 4:30 PM
Increases in Wheelchair Breakdowns, Repairs
and Adverse Consequences

Dan Wyles, ATP

Black Bear Medical
Bangor, ME
United States
dan@blackbearmedical.com

SS2 – Friday – 4:30 PM
Standardizing to a Higher Standard

If an M is next to the name of a presenter then the
presenter has an affiliation to a Manufacturer.

General Information

Introduction

The symposium will include scientific and clinical papers, research forums, in-depth workshops, panel sessions, and an extensive exhibit hall. Presentations will address the wheeled mobility and seating challenges and solutions for people with disabilities across the lifespan and conditions such as neuromuscular disorders, spinal cord injury and diseases of the spinal cord, orthopedic conditions, systemic conditions, obesity, or polytrauma.

Audience

- Assistive Technology Professionals (ATP)
- Seating and Mobility Specialist (SMS)
- Rehabilitation Engineering Technologist (RET)
- Occupational Therapists
- Physical Therapists
- Educators
- Manufacturers
- Product Developers
- People with Disabilities
- Physicians
- Nurses
- Rehabilitation Engineers & Technicians
- Vocational Rehabilitation Counselors
- Researchers
- Policy Makers

Program Learning Objectives

- Identify wheeled mobility and seating interventions for people with physical disabilities
- Discuss service delivery practices
- Identify and apply relevant current research
- Understand features and the clinical impact of wheeled mobility and seating technologies

Specific learning objectives are provided for each individual session.

Continuing Education Credit

The University of Pittsburgh, School of Health and Rehabilitation Sciences awards Continuing Education Units to individuals who enroll in certain educational activities. The CEU is designated to give recognition to individuals who continue their education in order to stay current in their profession. (One CEU is equivalent to 10 hours of participation in an organized continuing education activity.) Each person should claim only those hours of credit that they actually spent in the educational activity.

The University of Pittsburgh is certifying the educational contact hours of this program and by doing so is in no way endorsing any specific content, company, or product. The information presented in this program may represent only a sample of appropriate interventions.

Up to 1.7 Continuing Education Units (CEUs)can be earned to individuals for attending 17 hours of instruction. CEUs will be pro-rated for those not attending the full program.

Schedule

Thursday March 7, 2013

7:30 AM

Registration
(Governor's Registration Desk)

Continental Breakfast
(Ryman Exhibit Hall B 4, 5, 6)

8:30 AM

Opening
(Governor's Ballrooms A, B, C, D, E)

Welcome:

Mark R. Schmeler, PhD, OTR/L, ATP
Symposium Course Director
Director, Continuing Education Program
Assistant Professor, Department of Rehabilitation Science and Technology
School of Health and Rehabilitation Sciences
University of Pittsburgh

Rory A. Cooper, FISA/PVA
Distinguished Professor and FISA-Paralyzed Veterans of America Chair
Department of Rehabilitation Science and Technology
School of Health and Rehabilitation Sciences
University of Pittsburgh

9:00 AM

Special Sessions 1 – Papers
(Governor's Ballrooms A, B, C)

Special Session 1.1:
Overcoming the Walls of Disability
Mark Wellman

Special Session 1.2:
Training in Wheelchair Provision: Propelling Forward a Universal Standard
Chapal Khasnabis, World Health Organization, Geneva, Switzerland
Sarah Frost, PT, Motivational Charitable Trust, Backwell, United Kingdom

Special Session 1.3:
Development of an Outcomes Management System for Mobility
Richard M. Schein, PhD, MPH, University of Pittsburgh, Pittsburgh, PA, United States
Andi Saptono, PhD, University of Pittsburgh, Pittsburgh, PA, United States

10:00 AM
Keynote Address:
The Patient as an Empowered Consumer: Obstacles and Opportunities for the Rehab Patient in Patient-Centered Care.

Paul Tobin, MSW, President and Chief Executive Officer, United Spinal Association

11:00 AM to 1:00 PM

Walk-about Lunch
Ryman Exhibit Hall B 4, 5, 6 (lunch included in tuition)

11:00 AM
Posters
(Ryman Exhibit Hall B 4, 5, 6)

PO-01: Is Power or Manual the Mobility Choice for Those with Mid-to-Low Cervical SCI?
Christi Hutchison, PT, Craig Hospital, Englewood, CO, United States

PO-03: Development of a Wheelchair Repeated Test Simulating Caster-Up Handling by an Attendant
Hideyuki Hirose, PhD, PT, National Rehabilitation Center, Tokorozawa, Saitama, Japan

PO-04: How to Conduct a Wheelchair Seated Posture Survey Using ISO-Based Rysis
Toru Furui, PhD,PT, Osaka Kawasaki Rehabilitation University, City of Kaizuka, Japan
Masayo Furui, City Of Kaizuka, Japan

PO-05: Comfort and Function for Children with Cerebral Palsy: The CASPER Approach
Jun Murakami, Tokyo, Japan

PO-06: Managing Surfaces to Reduce Hospital-Acquired Infections
Andrea P. Dyrkacz, OT Reg.(Ont.), University Health Network - Toronto Western Hospital, Toronto, Ontario, Canada
Candy Pleasance, OTA, University Health Network - Toronto Western Hospital, Toronto, Ontario, Canada

PO-07: Seating Arrangements for Children with Insufficient Head Control
Sachie Uyama, Tottori Perfecture Child Development Support Division, Tottori, Japan

PO-08: Positioning for Children with Significant Functional Decline in their Lifespan
Denise Peischl, BSE, Alfred I. duPont Hospital for Children, Wilmington, DE, United States

PO-09: Comparison of Perceived Comfort with Pressure Distribution of ROHO PostureLITE
Jessica Norman, OTDS, Belmont University, Nashville, TN, United States
Rebekah Hart, OTDS, Belmont University Student, Nashville, TN, United States
Julie Walters
Scott Mcphee, DrPH, CPAM, OTR/L, FAOTA, Belmont University, Nashville, TN, United States

PO-10: Refined Landmarks and Their Assessment for Seated Posture Measurement
Takashi Handa, Saitama Industrial Technology Center, Kawaguchi-city Saitama-prefecture, Japan

PO-11: Pelvic Total Support and Trunk Total Support Groundbreaking Approach to Posture
Rosaria E. Caforio, Pro Medicare Srl, Mesagne, BR, Italy

PO-12: Adaptive Seating Facilitates Activity and Participation
Karen Lyng, OT, Vermund Larsen A/S, Aalborg, Sv, Denmark

PO-13: Influence of Cognitive Status in Persons with ALS on Powered Mobility & AAC
Michelle Gutmann, PhD, Vanderbilt University, Nashville, TN, United States

1:00 PM

IC01: Ethics for All
Simon A. Margolis, ATP, NRRTS, Maple Grove, MN, United States
Governor's Ballroom B

IC02: Analyzing Pressure Ulcer Clinical Practice Guidelines Regarding Seating
W. Darren Hammond, MPT, CWS, The Roho Group Inc., Belleville, IL, United States
Governor's Ballroom CD

IC03: A Systematic Approach to Alternative Drive Control Assessments
Becky Breaux, MS, OTR, ATP, Assistive Technology Partners, Denver, CO, United States
Ryan Ballroom AD

IC04: Wheelchair Clinics: Design & Structure
Joan E. Padgitt, PT, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Patricia Tully, OTR, ATP, TIRR Memorial Hermann Hospital, Houston, TX, United States
Cynthia Smith, PT, Craig, Englewood, CO, United States
Mary Shea, MA, OTR, ATP, Kessler Rehabilitation for Rehabilitation, West Orange, NJ, United States
Diane Thomson, MS, OTR/L, ATP, Rehabilitation Institute of Michigan, Detroit, MI, United States
Ryman Ballroom CF

IC05: Ultralight Manual Wheelchairs: Get it Right, Get it Covered
Robert Meehan, PT, ATP, Frazier Rehab Institute, Louisville, KY, United States
Ryman Studio PQR

IC06: Unsafe at Many Speeds - A Team Approach for a Safer Ride
Tamara J. Franks, MA, Randall Children's Hospital At Legacy Emanuel, Portland, OR, United States
Sue Johnson, CPST, Columbia Medical, Santa Fe Springs, CA, United States
Ryman Studio MNO

IC07: Does the Evidence Exist for a Wheelchair Skills Training Program?
Shirley Groer, PhD, VA Central Office, Office of Research and Development, Washington, DC, United States
Lee Kirby, MD, Dalhousie University, Halifax, NS, Canada
Ryman Studio L

IC08: Considerations for Bowel, Bladder and Bathing Management after SCI
Julie Jennings, PT, NCS, TIRR Memorial Hermann Hospital, Houston, TX, United States
Piper Jasin, PT, TIRR Memorial Hermann Hospital, Houston, TX, United States
Nelson Pang, RAZ Designs, Toronto, ON, Canada
Exhibit Hall

Paper Sessions 1:
Governor's Ballroom AE

PS1.1: Evaluation of a Physical Activity Monitoring System for Manual Wheelchair Users
Shivayogi V. Hiremath, MS, University of Pittsburgh, Pittsburgh, PA, United States

PS1.2: Refinement and Psychometric Reassessment of the Transfer Assessment Instrument
Chung-Ying Tsai, PT, Human Engineering Research Lab, University of Pittsburgh, Pittsburgh, PA, United States
Alicia Koontz, RET, ATP, Human Engineering Research Lab, University of Pittsburgh, Pittsburgh, PA, United States

PS1.3: Investigating Activity-Related Sonographic Change in Wheelchair Users' Shoulders
Yen-Sheng Lin, MS, Human Engineering Research Laboratories, University of Pittsburgh, Pittsburgh, PA, United States

PS1.4: Development and Evaluation of New Versions of Seated Posture Measurement Tools
Takashi Handa, Saitama Industrial Technology Center, Kawaguchi-city, Saitama-prefecture, Japan

2:30 PM

IC09: An Introduction to Economic Evaluation of Health
Bryce S. Sutton, PhD, James A. Haley VA Medical Center, Tampa, FL, United States
Governor's Ballroom B

IC10: Posture and Postural Tendencies: What's the Difference?
Thomas R. Hetzel, PT, ATP, Ride Designs, Sheridan, CO, United States
Governor's Ballroom CD

IC11: Consumer Organization Leaders Share Insights of a Sustainable Consumer Movement - A Panel Discussion
Ann Eubank, LMSW, OTR/L, ATP, CAPS, UsersFirst, A Program of United Spinal, Association, East Elmhurst, NY, United States
David Estrada, National Spinal Cord Injury Assn., Boston, MA, United States
Jessica Harthcock, National Spinal Cord Injury Assn., Nashville, TN, United States
Nick Libassi, National Spinal Cord Injury Association, East Elmhurst, NY, United States
Ryman Ballroom AD

IC12: World Health Organization Wheelchair Service Training Package
Sarah Frost, PT, Motivation Charitable Trust, Backwell, United Kingdom
Chapal Khasnabis, WHO International, Geneva, Switzerland
Ryman Ballroom CF

IC13: Following Through: Assessment and Training after Wheelchair Delivery
Tina L. Roesler, PT, MS, ABDA, TiLite, Pasco, WA, United States
Theresa Berner, MOT, OTR/L, ATP, Wexner Medical Center At The Ohio State University, Columbus, OH, United States
Ryman Studio PQR

IC14: Hindsight is 20/20: How the Past Can Enhance the Future of Wheelchair Seating
Diane B. Thomson, MS, OTR/L, ATP, Rehabilitation Institute of Michigan, Detroit, MI, United States
Patricia Tully, OTR, ATP, TIRR Memorial Hermann Hospital, Houston, TX, United States
Ryman Studio MNO

IC15: Back Support: Keystone to Seated Function and Physiology
Stephanie A. Tanguay, OTR, ATP, Motion Concepts, Tonawanda, NY, United States
Ryman Studio L

IC16: Introduction to the Wheelchair Clinic: An Interactive LIVE Assessment!
Steven Boucher, OTR/L, Sunrise Medical, Longmont, CO, United States
Exhibit Hall

Paper Sessions 2:
(Governor's Ballroom AE)

PS2.1: The Effect of Optimal Positioning for Pressure Relief in Functional Activities
Scott D. McPhee, DrPH, CPAM, OTR/L, FAOTA, Belmont University, Nashville, TN, United States

PS2.2: Inflammation in Individuals with SCI with Pneumonia and Pressure Ulcer Incidence
Shilpa Krishnan, MS, PT, University of Pittsburgh, Pittsburgh, PA, United States

PS2.3: Relative Effect of Pressure, Temperature and Shear on Non-Damaging Tissue Ischemia
Yi-Ting Tzen, PhD, University of Pittsburgh, Pittsburgh, PA, United States
David Brienza, PhD, University of Pittsburgh, Pittsburgh, PA, United States
Patricia Karg, MS, University of Pittsburgh, Pittsburgh, PA, United States

PS2.4: Spinal Cord Injury and Interface Pressure
Rachel M.Schofield, OT, BSc, Hons, University of Ulster, Jordanstown Co, Antrim, United Kingdom

3:45 PM

Break
Ryman Exhibit Hall B 4, 5, 6 (Refreshment included in tuition)

4:00 PM

IC17: The Wheelchair Skills Program and the WHO Guidelines on Wheelchair Provision
R. Lee Kirby, MD, Dalhousie University, NS Rehab Centre, Halifax, NS, Canada
Governor's Ballroom B

IC18: Evidence-Based Guidelines for IPM: Final Research Findings
Kimberly A. Davis, MSPT, ATP, ATECH Services, Concord, NH, United States
Evan Call, MS, NRCM, Weber State University, Centerville, UT, United States
Governor's Ballroom CD

IC19: Integrating Research into Practice Using the Functional Mobility Assessment
Elaina M. Halkiotis, MOT, OTR/L, ATP, Independence Care System, Brooklyn, NY, United States
Jean Minkel, PT, ATP, Minkel Consulting, New Windsor, NY, United States
Ryman Ballroom AD

IC20: Aligning Expectations for 21st Century Rehabilitation
Laura S. Wehrli, DPT, ATP, Craig Hospital, Englewood, CO, United States
Ryman Ballroom CF

IC21: Improving Patient Experience and Outcome: A Service Delivery Model Approach
Wendy Koesters, PT, ATP, OSUMC, Columbus, OH, United States
Ryan Martin, OT, ATP, CRTS, United Seating and Mobility, New Albany, OH, United States
Ryman Studio PQR

IC22: The Relationship Between Vision, Posture and Mobility
Teresa Plummer, PhD, MSOT, OTR, ATP, Belmont Univeristy, Nashville, TN, United States
Ryman Studio MNO

IC23: Why We Do the Things We Do? Transfer of Learning to Clinical Practice
Patricia E. Tully, OTR, ATP, TIRR, Houston, TX, United States
Lois Brown, MPT, ATP/SMS, Invacare Corp., Elyria, OH, United States
Ryman Studio L

IC24: How to Select a Proper Stander for Children with Disabilities
Yunn-Yi Pau-Lee, PT, MA, ATP, CPAMC, Edison, NJ, United States
Exhibit Hall

Paper Sessions 3:
(Governor's Ballroom AE)

PS3.1: A Consolidated Model of Clinical Seating Services
Marlene Holder, PT, Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON, Canada

PS3.2: Increasing AT and Interprofessional Online Training
Mary Goldberg, M.Ed., University of Pittsburgh, Pittsburgh, PA, United States

PS3.3: Specialized Clinical Affiliation in Seating and Mobility
Penny J. Powers, PT, MS, ATP, Vanderbilt Medical Center - Pi Beta Phi Rehabilitation Institute, Nashville, TN, United States
Renee Brown, PT, PhD, Belmont University, Nashville, TN, United States
John Hackett, PT, DPT, Results Physiotherapy, Springfield, TN, United States

PS3.4: Ultra-light Manual Wheelchair Prescription Pattern - Can It Be Influenced?
Rosemarie Cooper, MPT, ATP, University of Pittsburgh , Pittsburgh, PA, United States

5:30 PM to 7:30 PM

Welcome Reception
Ryman Exhibit Hall B 4, 5, 6 (Included in tuition)

Friday March 8, 2013

7:00 AM

Continental Breakfast (Ryman Exhibit Hall B 4, 5, 6)

8:00 AM

IC25: Research is a Necessary Evil
Shirley Groer, PhD, VA Central Office, Office of Research & Development, Washington, DC United States
Governor's Ballroom B

IC26: Tissue Trauma… Tilt in Space… Surfaces...
Jane E. Fontein, OT, Janefontein, Vancouver, BC, Canada
Governor's Ballroom CD

IC27: 24/7 Pressure Management in the Acute Rehab Setting
Steven M. Dahling, ATP, Rusk Institute of Rehabilitation Medicine, New York, NY, United States
Matthew Bernardo, OTR/L, Rusk Institute of Rehabilitation Medicine, New York, NY, United States
Allison Kearney, MS, OTR/L, ATP, Rusk Institute of Rehabilitation Medicine, New York, NY, United States
Talia Mouldovan, OTR/L, Rusk Institute of Rehabilitation Medicine, New York, NY, United States
Ryman Ballroom AD

IC28: An Update on the Separate Benefit for Complex Rehab Technology Under Medicare
Elizabeth Cole, MSPT, U. S. Rehab, Waterloo, IA, United States
Laura Cohen, PT, PhD, ATP, Rehab & Tech Consultants, LLC, Arlington, VA, United States
Ryman Ballroom CF

IC29: Wheelchair Management in Acute Care: From Inventory to Innovation
Andrea P. Dyrkacz, OT Reg.(Ont.), University Health Network - Toronto Western Hospital, Toronto, ON, Canada
Candy Pleasance, OTA, University Health Network - Toronto Western Hospital, Toronto, ON, Canada
Ryman Studio PQR

IC30: Configuring Powered Mobility Systems for the First Time User
Karen M. Kangas, OTR/L, ATP, Private Practice, Shamokin, PA, United States
Lisa Rotelli, Adaptive Switch Laboratories, Inc, Spicewood, TX, United States
Ryman Studio MNO

IC31: The Impact of Lower Extremities on the Posture of Wheelchair Users
Bart A. Van Der Heyden, PT, The Roho Group Europe, Destelbergen, Belgium
Ryman Studio L

IC32: Clinical Applications for Power Wheelchair Platforms
Amy M. Morgan, PT, ATP, Permobil, Inc., Lebanon, TN, United States
Hymie Pogir, Permobil, Inc. , Lebanon, TN , United States
Michelle Kerr, PT, ATP, Spaulding Rehabilitation Hospital, Boston, MA, United States
Exhibit Hall

Paper Sessions 4:
(Governor's Ballroom AE)

PS4.1: A Model for Increasing Wheelchair Lifecycles in Less Resourced Settings
Maria L. Toro Hernandez, MS, University of Pittsburgh, Pittsburgh, PA, United States

PS4.2: Assistive Technology and the ICF as a Concept: A Case Study
Erika Teixeira, MOT, Private Practice, Sao Paulo, Brazil

PS4.3: Manual Wheelchair User Activity Classification in Natural Environments
Alejandra M. Ojeda, Alejandra M. Ojeda,
Universidade Federal do Triângulo Mineiro, Brazil

PS4.4: Assistive Technology, Occupation, Independence and Poverty
Marinho Cezar Da Cruz, PhD, Universidade Federal De São Carlos, São Carlos, SC, Brazil

9:30 AM

IC33: Does My Evaluation Provide Enough Documentation to Get the Product Funded?
Claudia Amortegui, MBA, The Orion Consulting Group, Inc., Denver, CO, United States
Governor's Ballroom B

IC34: Dosing for Pediatric Standing Programs: A Systematic Review
Ginny Paleg, DScPT, MPT, PT, Montgomery County Schools, Silver Spring, MD, United States
Governor's Ballroom CD

IC35: Stop, Look and Listen!
Andrina J. Sabet, PT, ATP, Cleveland Clinic Children's Hospital for Rehabilitation, Cleveland, OH, United States
Lauren Rosen, PT, MPT, MSMS, ATP, St. Joseph's Children's Hospital of Tampa, Tampa, FL, United States
Ryman Ballroom AD

IC36: Know, Go, Grow - Pediatric Mobility Bases and Designs for Independent Mobility
Kay E. Koch, OTR/L,ATP, Mobility Designs/ CHOA, Atlanta, GA, United States
Ryman Ballroom CF

IC37: Thinking Outside of the Box: If I Cannot Find It, I Will Make It
Yunn-Yi Pau-Lee, PT, MA, ATP, CPAMC, Edison, NJ, United States
Ed Lipositz, ATP, CRTS, Schwarz Medical, Farmingdale, NE, United States
Ryman Studio PQR

IC38: Let's Get the Show on the Road: Integrating Life Support with Mobility Systems
Mala Aaronson, OTR/L, CRTS, NSM, North Easton, MA, United States
Lois Brown, MPT, ATP/SMS, Invacare Corp., Elyria, OH, United States
Ryman Studio MNO

IC39: Freedom: An Overview of the Functional & Therapeutic Benefits of Dynamic Seating
Jay Doherty, OTR, ATP, SMS, Pride Mobility Products Corporation, Exeter, PA, United States
Governor's Ballroom B

IC40: Power Assist: Fundamentals of Programming and Applications for Successful Operation
Theresa F. Berner, MOT, OTR/L, ATP , Wexner Medical Center at The Ohio State University, Columbus, OH, United States
Heather Schriver, PT, Wexner Medical Center at The Ohio State University, Columbus, OH, United States
Ryman Studio L

Paper Sessions 5:
(Governor's Ballroom AE)

PS5.1: The Design and Efficacy of a Maximally Pressure and Tone Reducing Wheelchair
Andrea P. Dyrkacz, OT Reg.(Ont.), University Health Network - Toronto Western Hospital, Toronto, ON, Canada
Candy Pleasance, OTA, University Health Network - Toronto Western Hospital, Toronto, ON, Canada

PS5.2: The Use of Custom Bed Positioning for People with Severe Physical Disabilities
Karen L. Wills, OT/L, State of Tennessee Division of Intellectual Disabilities, Nashville, TN, United States
Deborah Poirier, COTA/L, ATP, State of Tennessee Division of Intellectual Disabilities, Nashville, TN, United States

PS5.3: Helping Wheelchair Users be Pro-Active with their Seating System
Wayne H. Hanson, Xplore Mobility, Bozeman, MT, United States
Amber Yampolsky, PT, ATP, Arnold Palmer Hospital for Children, Winter Garden, FL, United States
Andy Foster, Medical Mobility, Murfreesboro, TN, United States

PS5.4: Seating and Positioning for Children with Rett Syndrome
Denise Peischl, BSE, Alfred I. duPont Hospital for Children, Wilmington, DE, United States

10:45 AM

Break
Ryman Exhibit Hall B 4, 5, 6 (Refreshment included in tuition)

11:00 AM

IC41: Functional Positioning for Preschoolers and Beyond: Complex Conditions
Melissa K. Tally, Perlman Center, Cincinnati Children's Hospital, Cincinnati, OH, United States
Governor's Ballroom B

IC42: A Programmatic and Pragmatic Approach to Providing Power Mobility for People with ALS
Steven J. Mitchell, OTR/L, ATP, Cleveland VA Medical Center, Cleveland, OH, United States
Governor's Ballroom CD

IC43: Wheeled Mobility Prescription for Infants, Children and Adolescents
Elaine Antoniuk, B.Sc, PT, Sunny Hill Health Centre for Children, Vancouver, BC, Canada
Beth Ott, MSc, PT, Sunny Hill Health Centre for Children, Vancouver, BC, Canada
Ryman Ballroom AD

IC44: Seating for the Complex Child: Why Does it Have to be So Complex?
Simon Hall, Central Remedial Clinic, Dublin, Ireland
Ryman Ballroom CF

IC45: Outcome Measures as Part of Quality Assurance in a Seating and Mobility Clinic
Carmen P. Digiovine, PhD, ATP/SMS, RET, The Ohio State University, Columbus, OH, United States
Stephanie Meehl, BS, The Ohio State University, Columbus, OH, United States
Theresa Berner, MOT, OTR/L, ATP, Wexner Medical Center at The Ohio State University, Columbus, OH, United States
Ryman Studio PQR

IC46: Wheelchair Configuration as it Relates to Transportation and the Driving Task
Wes Perry, ATP, CDRS, MSBME, Mississippi State University , T.K. Martin Center for Technology and Disability , Mississippi State, MS, United States
Dan Allison, MS OTR/L, ATP, CDRS, Mississippi State University , T.K. Martin Center for Technology and Disability , Mississippi State, MS, United States
Ryman Studio MNO

IC47: Telerehab for Self-Management of Lower Limb Swelling in Wheelchair Users
Mary Jo Geyer, PT, PhD, FCCWS, C.Ped, CLT-LANA, University of Pittsburgh, Pittsburgh, PA, United States
Becky Faett, PhD, RN, University of Pittsburgh, Pittsburgh, PA, United States
Charles Vukotich, BS, University of Pittsburgh, Pittsburgh, PA, United States
Sukhmeet Manpotra, MS, OTR/L, University of Pittsburgh, Pittsburgh, PA, United States
Ryman Studio L

IC48: Prone and Standing Power Wheelchair Driving Positions: Mock Ups, Trials and Outcomes
Craig Rowitz, MPT, ATP, Care Medical, Cincinnati, OH, United States
Exhibit Hall

Paper Sessions 6:
(Governor's Ballroom AE)

PS6.1: Power Wheelchair Driving Outdoors: Problems and Strategies Identified by Users, and Potential Solutions
Hongwu Wang, PhD, University of Pittsburgh, Pittsburgh PA, USA

PS6.2: The Influence of Belt Use on Reach and Push Function in Active Wheelchair Users
Allen R. Siekman, Allen Siekman Consulting, Ben Lomond, CA, United States

PS6.3: Use of an Environmental Control Unit by a Power Wheelchair User in Higher Education
Laura A. Rice, PhD, MPT, ATP, University of Illinois, Champaign, IL, United States

PS6.4: Staying on Track - Evaluating the Efficacy of Power Wheelchair Tracking
Michelle L. Lange, OTR, ABDA, ATP/SMS, Access to Independence, Arvada, CO, United States
Lois Brown, MPT, ATP/SMS, Invacare Corp., Elyria, OH, United States

12:15 PM to 1:30 PM

Walk-about Lunch
Ryman Exhibit Hall B 4, 5, 6 (lunch included in tuition)

1:30 PM

IC49: Enhancing Your Practice Through Sustained Consumer Engagement
Ann Eubank, LMSW, OTR/L, ATP, CAPS, UsersFirst, A Program Of United Spinal Association, East Elmhurst, NY, United States
Nick Libassi, United Spinal Association, East Elmhurst, NY, United States
Governor's Ballroom B

IC50: That's Just Wrong - Using Seating Disasters to Improve Future Prescriptions
Stefanie Laurence, OT, Motion Specialties, Toronto, ON, Canada
Governor's Ballroom CD

IC51: Why, When and How to Introduce Self-Mobility in Young Children
Silvana Contepomi, PT, Aedin, San Isidro, Argentina
Ryman Ballroom AD

IC52: Do the Coverage Criteria Match My Client's Functional Needs?
Elizabeth Cole, MSPT, U. S. Rehab, Waterloo, IA, United States
Ryman Ballroom CF

IC53: The Role of Friction and Shear Forces in Pressure Ulcer Generation
Mark J. Payette, CO, Tamarack Habilitation Technologies Inc., Blaine, MN, United States
Caroline Portoghese, OTR/L, ATP, University of Minnesota Medical Center - Fairview Saint Paul, MN, United States
Ryman Studio PQR

IC54: Creativity: Does It Still Have a Place in Rehab?
Kathryn J. Fisher, B.Sc. (OT), ATP, Shoppers Home Health Care, Toronto, ON, Canada
Lisa Rotelli, Adaptive Switch Laboratories, Inc. Spicewood, TX, United States
Nicole Laprade, M.Sc. (OT), Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON, Canada
Ryman Studio MNO

IC55: Get Smart with SMA: Positioning & Power Mobility Set-Ups for Clients with Spinal Muscular Atrophy
Nicole S. Wilkins, OT, Sunny Hill Health Centre for Children, Vancouver, BC, Canada
Ryman Studio L

Paper Sessions 7:
(Governor's Ballroom AE)

PS7.1: Pediatric Manual Wheelchair Propulsion and its Differences from Adult Populations
Lauren Rosen, PT, MPT, MSMS, ATP, St. Joseph's Children's Hospital of Tampa, Tampa, FL, United States

PS7.2: Effects of Wheelchair Type & Task on Mobility Performance: Speed and Collisions
Helen M. Hoenig, MD, MPH, Duke University and Durham VA Medical Center, Durham, NC, United States
Kevin Caves, Duke University, Durham, NC, United States

PS7.3: Effects of Wheelchair Configuration on Manual Wheelchair Propulsion Training
Ian M. Rice, PhD, MOT, University of Illinois Urbana Champaign, Champaign, IL, United States

PS7.4: Procedures for Identifying and Managing Wheelchair and Seating Repairs
Ryan D. Crosby, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Joan Padgitt, PT, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO, United States

3:00 PM

IC56: Put Me In, Coach, I'm Ready!
Jacqueline Black, MSPT, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Randy Potter, VAMC Eastern Colorado Healthcare System, Denver, CO, United State
Governor's Ballroom B

IC57: Pediatric Manual Mobility - Seating Children for Function
Lauren Rosen, PT, MPT, MSMS, ATP, St. Joseph's Children's Hospital of Tampa, Tampa, FL, United States
Governor's Ballroom CD

IC58: Comparing the Tongue Drive to Standard Methods of Assistive Technology Control
Deborah L. Pucci, PT, MPT, ATP, Rehabilitation Institute of Chicago, Chicago, IL, United States
Ryman Ballroom AD

IC59: Frustrated with Funding? Practical Details of How to Advocate - A Real World Story
Ann Eubank, LMSW, OTR/L, ATP, CAPS, UsersFirst, A Program Of United Spinal Association, East Elhurst, NY, United States
Diane Thomson, MS, OTR/L, ATP, Rehabilitation Institute of Michigan, Detroit, MI, United States
Ryman Ballroom CF

IC60: The Mat Assessment - It's Not All or Nothing
Stefanie Laurence, OT, Motion Specialties, Toronto, ON, Canada
Ryman Studio PQR

IC61: Posture and How it Develops: Standing & Sitting Considerations for the Young Child
Sharon L. Pratt, PT, Sharon Pratt Consulting, Longmont, CO, United States
Clare Wright, OT, BSc, James Leckey Design, Dunmurry, Northern Ireland
Ryman Studio MNO

IC62: Training Consumers for the Skills of Wheelchair Transportation Safety
Mary Ellen Buning, PhD, OTR/L, ATP/SMS, University of Louisville & Frazier Rehabilitation Institute, Louisville, KY United States
Thaddeus Hazzard, ATP, ATG Rehab, Lexington, KY, United States
Ryman Studio L

Paper Sessions 8:
(Governor's Ballroom AE)

PS8.1: A Modification of the Functional Mobility Assessment for School Children
Karen Rispin, LeToutneau University, Longview, TX, United States

PS8.2: Implementing the FEW into Everyday Best Practices
Michael Bender, OTR/L, ATP, CDRS, Therapeutic Specialties, Inc., Town and Country, MO, United States
Sue Tucker

PS8.3: Functional Mobility Outcomes of Individuals Receiving a New Seating Device
Renee M. Brown, PT, PhD, Belmont University, Nashville, TN, United States
Stacey Lindsley, SPT, Belmont University Department of Physical Therapy, Nashville, TN, United States

PS8.4: Translation of the Functional Mobility Assessment into Portuguese for Brazilian Health Professionals
Alessandra Cavalcanti, OT, Brazil

4:30 PM

Governor's Ballroom ABCD

Forum:
Increases in Wheelchair Breakdowns, Repairs and Adverse Consequences
Lynn Worobey
University of Pittsburgh, Pittsburgh, PA, United States

Panel Discussion:
Standardizing to a Higher Standard: Addressing QUALITY as a Known Challenge with Wheeled Mobility Products
Governor's Ballroom ABCD

Panel Moderator: **Kendra Betz, MSPT, ATP**

Panel:
Jim Black
Rory A. Cooper, PhD
Doug Gayton, ATP
Simon Hall
Leslie Samuelson, OTR/L, ATP
Lynn A. Worobey
Dan Wyles, ATP

7:00 PM

ISS Social Event Honky-Tonk (2.0)!
The World Famous Nashville Palace

Saturday March 9, 2013

7:30 AM

Continental Breakfast
(Governor's Foyer and Ryman Foyer)

8:00 AM

IC63: Foamology 101
Sharon L. Pratt, PT, Sharon Pratt Consulting, Longmont, CO, United States
Evan Call, MS, NRCM, Weber State University, Centerville, UT, United States
Governor's Ballroom B

IC64: Man vs. Chair! Who Wins in the Challenge of Mobility?
Sheila N. Buck, B.Sc.(OT), Reg. (Ont.), ATP, Therapy NOW! Inc., Milton, ON, Canada
Governor's Ballroom CD

IC65: Power Wheelchair Driving Skills Assessment: What Do You Need to Know for Your Practice?
Deepan Kamaraj, MD, University of Pittsburgh, Pittbsburgh, PA, United States
Brad Dicianno, MD, MS, University of Pittsburgh, Pittbsburgh, PA, United States
Ryman Ballroom AD

IC66: Biomechanics and Its Application to Seating
Joel M. Bach, PhD, Colorado School of Mines, Golden, CO, United States
Kelly G. Waugh, PT, MAPT, ATP, Assistive Technology Partners, Denver, CO, United States
Ryman Ballroom CF

IC67: The Benefits of Gait Training
Melissa Fansler, ATP, Innovation In Motion, Angola, IN, United States
Ryman Studio PQR

IC68: An Activity-Based Restorative Therapy Approach to Wheelchair Prescription
Erin Michael, PT, DPT, ATP, Kennedy Krieger Institute, Baltimore, MD, United States
Meredith Bourque, DPT, Kennedy Krieger Institute, Baltimore, MD, United States
Beth Farrell, PT,DPT,ATP, Kennedy Krieger Institute, Baltimore, MD, United States
Ryman Studio MNO

IC69: ALS and Therapy Interventions
Susan Calyer, OTR/L, ATP, ALS Regional Center St. Peter's Hospital, Albany, NY, United States
Ryman Studio L

Paper Sessions 9:
(Governor's Ballroom AE)

PS9.1: The Use of Tilt-in-Space in Seating Systems
Orlagh B. Daly, OT, University of Ulster, Belfast, United Kingdom

PS9.2: The Effectiveness of Specialist Seating Provision for Nursing Home Residents
Orlagh B. Daly, OT, University of Ulster, Belfast, United Kingdom

PS9.3: Where's My Wheelchair?
Joan E. Padgitt, PT, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Randy Potter, ATP, SMS, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Jacqueline Black, MSPT, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Patrice Kennedy, MPT, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO, United States
Ryan Crosby, ATP, VAMC Eastern Colorado Healthcare System, Denver, CO , United States

PS9.4: Development of a Wheelchair Mounted Robotic Device for Assisting with Transfers
Garrett G. Grindle, MS, University of Pittsburgh, Pittsburgh, PA, United States

9:30 AM

IC70: Ethics and Certification: An Update on Raising the Bar of Professionalism
Carmen P. Digiovine, PhD, ATP/SMS, RET, The Ohio State University, Columbus, OH, United States
Julie Piriano, PT, ATP/SMS, Pride Mobility Products, Exeter, PA, United States
Mike Seidel, ATP CRTS, United Seating & Mobility, Kansas City, KS, United States
Stefanie Laurence, B.Sc. OT, OT Reg. (Ont.), Motion Specialties, Toronto, ON, Canada
Governor's Ballroom B

IC71: Clinical Needs and Product Applications for Bariatric Clients of All Sizes
Virginia Walls, PT, MS, NCS, ATP, SMS, Medstar National Rehabilitation Network, Washington, DC, United States
Jeff Cupps, ATPA, ATG Rehab, Baltimore, MD , United States
Governor's Ballroom CD

IC72: Custom Contoured Seating: Ensuring Successful Outcomes
Kelly G. Waugh, PT, MAPT, ATP, Assistive Technology Partners, Denver, CO, United States
Ryman Ballroom AD

IC73: Functional Mobility for the Geriatric Population - The Meat and Potatoes
Kathy G. Adkins, OTR, Adkins Advanced Therapy Services, Calhoun, KY, United States
Leta Kant, PT, ATP, Rehabcare, Hendersonvilee, TN, United States
Judy Freyermuth, PT, Peoplefirst Rehabilitation, Bridgewater, MA, United States
Ryman Ballroom CF

IC74: Kinesio® Tape: Case Studies for Use as a Dynamic Postural Support
Erin M. Pope, PT, MPT, Aaron W. Perlman Center at Cincinnati Children's Hospital Medical Center, Cincinnati, OH, United States
Katherine Eingle, MOT, OTR/L, Aaron W. Perlman Center at Cincinnati Children's Hospital Medical Center, Cincinnati, OH, United States
Ryman Studio PQR

IC75: Service Dogs for People with Mobility Impairment
Kendra L. Betz, MSPT, ATP, Rehabilitation & Prosthetic Service, VA Central Office, Washington, DC, United States
Ryman Studio MNO

IC76: Back it Up! Basics of Back Supports
Brenlee Mogul-Rotman, OT, Toward Independence, Richmond Hill, ON, Canada
Ryman Studio L

Paper Sessions 10:
(Governor's Ballroom AE)

PS10.1: Review of Wheelchair Provision in the VA for Veterans with Amputations
Samuel L. Phillips, PhD, CP, FAAOP, Veterans Administration, Tampa, FL, United States

PS10.2: Beyond the "Support Group": Empowering People with SCI Through Networking
Bryan McCormick, M.S., Office of Vocational Rehabilitation, Pittsburgh, PA, United States

PS10.3: Measuring Seated Posture: The Seated Posture Scale
Lelia S. Barks, PhD, ARNP, Veterans Administration; University Of South Florida, Tampa, FL, United States

PS10.4: Predictors of Falls from Wheelchairs
Shirley Groer, PhD, VA Central Office, Washington, DC, United States

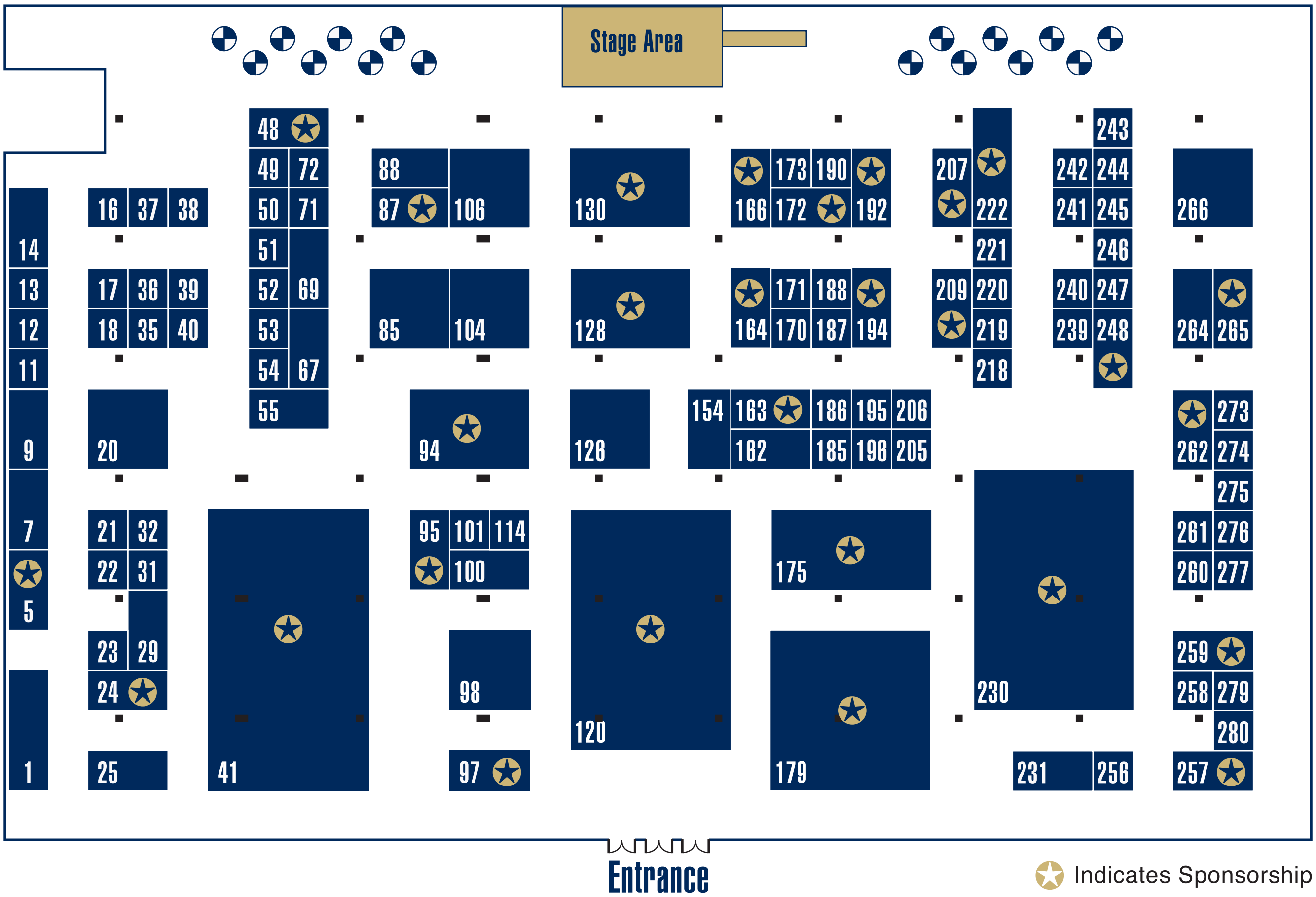
11:00 AM

Governor's Ballroom ABCD

Closing Session:
Hurdling Adversity: Empowering Life
John Register

12:30 PM

ISS Ends!



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Thursday

March 7, 2013

IC01: Ethics for All

Simon A. Margolis, ATP

Ethics Phobia

Ethics can be a vague and frustrating topic. Some believe that it is very personal — "everyone has their own view of right and wrong, so it's impossible to get a consensus." Others see ethics as black and white. They don't want their opinions challenged. While a third group thinks that talking about ethics is useless, "Some people are good and some are rotten, talking about ethics won't change that fact."

Some fear that ethics is bad for business. Ethical concerns, such as the obligations that a company has to customers, employees and others get in the way of hard-driving competitive strategies. I frequently hear, "If we don't do it, our competitors will, and they'll get the client or make the sale." They argue "we can't afford ethics in our business," or

"leave it to the market to reward and punish companies." One of more predominant fears I hear is that moral convictions are bad for your career. I was once told by a colleague, "When I see something going on at work that I think is wrong, I keep my mouth shut. All of this ethical talk is great, but not everyone is cut out to play the hero." These folks assume that only people at the top can act on their values, while other employees must accept the status quo. Two unrealistic fears that are central to ethics phobia come together on this point. The first is that the business world is not friendly to people with moral integrity, and second is that employers don't want employees to act on their moral convictions.

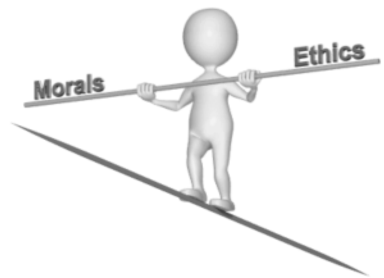
Values, Morals, Professional Ethics and Business Ethics

Values are the beliefs of a person or social group in which they have an emotional investment - either for or against something. They are rules by which we make decisions about right and wrong, should and shouldn't, good and bad. They also tell us which are more or less important, which is useful when we have to trade off meeting one value over another. Typical values include honesty, integrity, compassion, courage, honor, responsibility, patriotism, respect and fairness.

Morals are values which we attribute to a system of beliefs, typically a cultural; religious; political and/or philosophical concepts and beliefs. These values get their authority from something outside the individual - a higher being or higher authority. Society uses this system to determine whether given actions are right or wrong.

Ethics is about our actions and decisions. They are generally rules or standards governing the conduct of a person or the members of a profession. Professional ethics and standards of practice are those set down by our professional organization like NRRTS, RESNA, AOTA, APTA, etc.

Business ethics can be defined as the written and unwritten codes of principles and values that preside over the decisions and actions that are made within the business or organization. In the business world, the company's culture sets the standards for determining the difference between good and bad decision-making and professional work behavior as well as doing what is right within the organization. The unwritten code is the one that can be most problematic.



How do we balance these often conflicting imperatives?

Key Ethical Concepts

Autonomy is the personal rule of self that is free from controlling interferences by others and free from personal limitations that prevent meaningful choice.

Respect for autonomy should be one of the fundamental guidelines of clinical ethics. In Complex Rehab Technology service delivery autonomy is not simply allowing patients to make their own decisions. RTSs and clinicians have an obligation to create the conditions necessary for autonomous choice in others. For a Complex Rehab Technology professional, respect for autonomy includes respecting an individual's right to self-determination as well as creating the conditions necessary for autonomous choice

Dignity of Risk - The world is not always safe, secure and predictable. Every day there is a possibility we may have to risk something or everything. This is the way the real world is for all us. It should also be the same for the consumers we save.

Beneficence is action that is done for the benefit of others. Beneficent actions can be taken to help prevent or remove harms or to simply improve the situation of others.

Non-maleficence is characterized by the adage "First, do no harm." It is based on the premise that it is more important not to do harm, than to do good.

Balance

Complex Rehab Technology professional are expected to refrain from causing harm, but they also have an obligation to help the consumers they serve. In addition, the CRT professional has the responsibility to allow the consumer to make his or her own decisions about the technology he or she receives. Due to the nature of the relationship between Complex Rehab Technology professional and patients, CRT professionals do have an obligation to prevent and remove harms, and weigh and balance possible benefits against possible risks of an action while still allowing the consumer to maintain a level of control over the process. In order to truly fulfill our professional responsibilities we need to reject the tyranny of the OR and embrace the genius of the AND. It is our responsibility to balance the various ethical imperatives of autonomy; Dignity of Risk; Beneficence and Non-maleficence.

Here are two typical examples of the balancing act between autonomy and beneficence. I don't have the "right" answer but we all need to wrestle with these situations as they arise.

- Consumer with skin flap surgery wants to continue to sit on the 1" foam cushion she has used for years.
- A consumer with ALS wants to use a scooter rather than a power wheelchair that will "change with his needs".

Situational ethics can be described as a system by which acts are judged within their contexts instead of by categorical imperatives.

Here's an analogy that might shed some light on issues that we all face as CRT clinicians and suppliers.

Rolling through a stop-sign – the premise is that it is a bad thing. What if everybody did? The "Generalization Argument" can be used to justify our behavior in almost any scenario:

- Everyone won't roll through, so it's OK for me to do it.
- Everyone's going to do it, so I might as well.
- Either everyone will or they won't, my actions won't affect the outcome so, I might as well!

I will leave it up to you to recognize if you employ this type of argument in your business and professional lives.

Advocacy

For the sake of this discussion an advocate is defined as one who pleads or champions the cause of another. I pose three questions to you:

- Is it moral and/or ethical for you to advocate for your client?
- What do you as an advocate get out of the advocacy activity?
- Given a finite amount of resources, does an advocate/advocacy effort deal with issues of rightness, fairness and equity?

Here is an example as food for thought.

In a school setting a child's IEP calls for specialized, individualized devices and equipment that cost $8,000. Because of this mandated expenditure the school district is unable to buy new gym equipment that will be used by all students. Is this right; is this fair and equitable?

Advocacy as Enlightened Self-interest

People who act to further the interests of others - or the interests of the group to which they belong - ultimately end up serving their own self-interest. This concept is typified by the belief that an individual, group, or even a commercial entity will, "Do well by doing good."

IC02: Analyzing the Pressure Ulcer Clinical Practice Guidelines Regarding Seating

W. Darren Hammond, MPT, CWS

Learning Objectives

By the end of the presentation, participants will be able to:

1. Identify at least two published clinical practice guidelines regarding pressure ulcer management.
2. Discuss at least three specific clinical practice guideline recommendations related to seating and positioning in the prevention or treatment of pressure ulcers.
3. Demonstrate how three clinical practice guidelines could be used in to develop better outcomes with your patient population.

General Overview:

Pressure ulcer management continues to be a challenge to the healthcare community with prevalence rates in some care settings reaching upward to 25% or more. Quite commonly in pressure ulcer management, physicians, nurses and therapists begin to consider management strategies prior to a full complete assessment and investigation into the actual cause of a pressure ulcer. Typically, topical dressings are considered, advanced modalities may be chosen, bed support surfaces are investigated; however consideration into the management of the extrinsic risks, including a full seating assessment of a client who may have a sitting acquired pressure ulcer, is somehow commonly overlooked. With more sitting acquired ulcers being identified and policies and procedures being implemented into clinical practice to attempt to reduce these type of pressure ulcers, more focus needs to be on correct management strategies, including seating, positioning and mobility. In addition, earlier intervention is now being considered as paramount to reduce these sitting acquired pressure ulcers.

Unfortunately, knowledge and skill sets of superior seating and positioning strategies and effective clinical practice of pressure ulcer management is lacking across practice settings, particularly early care. Currently there are multiple clinical practice guidelines used to assist clinicians in developing plans of care to drive better evidence based practice to reduce pressure ulcers. However, do most of the clinicians who are actively participating in seating and mobility prescription, truly understand what the guidelines say regarding prevention and treatment of pressure ulcers? More and more often finding a clinician, who has the mix of complex rehabilitation and wound care experience, to conduct a full extensive seating assessment, is becoming more of a challenge to the pressure ulcer management team.

In this interactive presentation, discussions will revolve around the specific published clinical practice guidelines developed for pressure ulcer management. Specific to this presentation, we will review some of the specific guidelines, which revolve around seating, positioning and mobility. In addition, we will also discuss and analyze how these guidelines should be used in common practice across all care setting to prevent and treat individuals with pressure ulcers.

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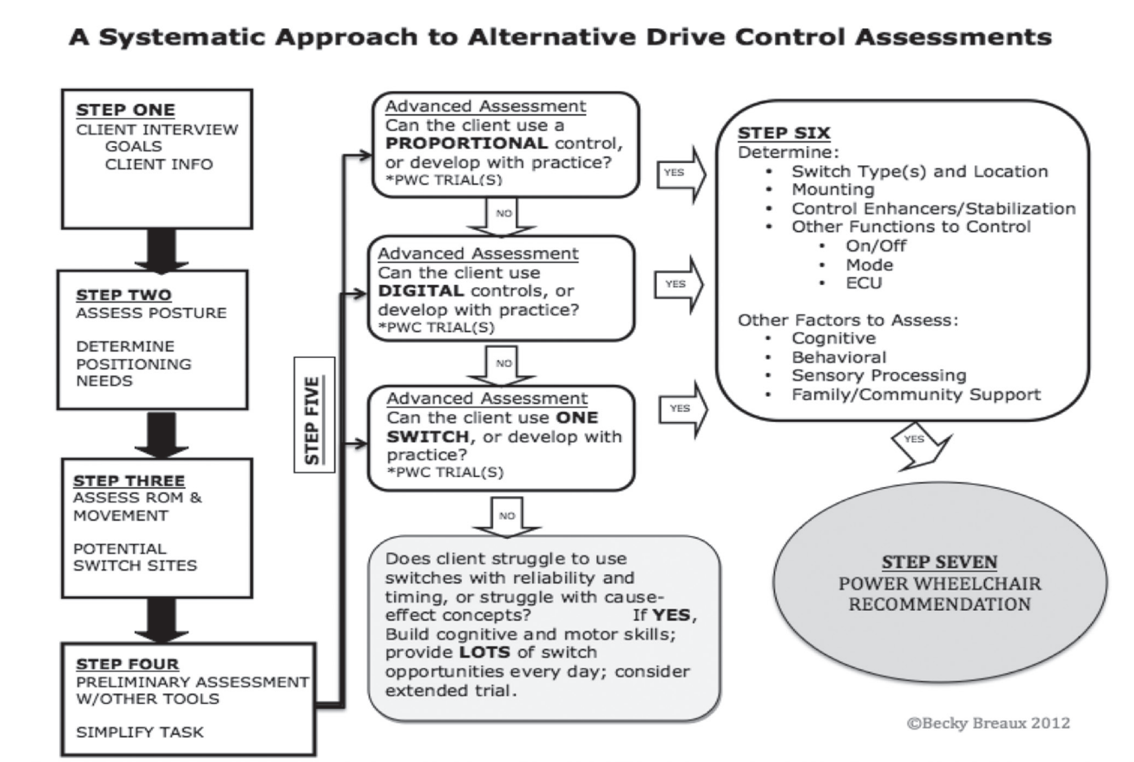
IC03: A Systematic Approach to Alternative Drive Control Assessments

Becky Breaux, MS, OTR, ATP,

Many people with physical disabilities require a power wheelchair for mobility, but are not able to operate a standard joystick due to physical, sensory, or cognitive limitations. As a result, a comprehensive assessment to determine the user's most efficient and effective method for controlling the power wheelchair is required. This discussion offers a systematic process to guide the specialist and team in this decision making process, which can be applied to clients with various types of disabilities across the lifespan.



Step One: Client Interview

A successful assessment begins with a thorough client-centered interview and evaluation, and a determination of the individual's goals. It is critical to understand why the client is attending the evaluation and what the individual (or the caregivers) hope to accomplish. In general, the interview and evaluation will be most effective if a comprehensive form is used as a guide. Many organizations have already developed evaluation forms that can be used or modified. One example, the "Wheelchair and Seating Evaluation and Justification" form identifies key questions related to the client's goals, medical and surgical history, ADL skills, cognitive, sensory and behavioral status, transportation and accessibility issues, mat exam, use of trial equipment, and seating goals (Taylor, 2008).

Step Two: Assess Posture; Determine Positioning Needs

Determining a client's positioning needs is the second step in the assessment process. Many benefits of good seating and positioning exist (Waugh, 2008). When a client achieves the most stable and upright posture possible, his or her ability to use the head and extremities for functional activities or for the operation of a joystick or single switches will improve. A stable posture can impact respiration and digestion, the ability to attend and focus on a desired task, and the user's overall comfort in the system. For these reasons, it is important to determine the client's seating technology needs, through a mat exam and seating simulation, before beginning an assessment of the client's alternative drive control options. The user's positioning can have a profound effect on his or her abilities with these devices.

Step Three: Assess Range of Motion and Movement

Once an optimum seated posture is determined, the team can assess a client's ability to use the head or extremities as potential access sites. The team may be able to assess a user's abilities through observation, by eliciting specific movements through play, or by asking the client to demonstrate specific movements at various joints of the body. Some clinicians describe a switch hierarchy that specialists can follow in the assessment process, based on sites that tend to be used most frequently. Lange (2008) puts assessment sites in the following order: hands, head, mouth, feet, hips, and shoulder/forearm.

The user's preferences are a critical factor to consider when choosing an optimal site. It's also important to be aware of the potential negative consequences a movement may elicit. For example, while the head is commonly used to control devices, neck and head movements may trigger reflexes, lead to pain or fatigue, cause dizziness, or interfere with the user's visual performance.

Choosing the type of drive control system a client needs is an important decision. I think about these systems as belonging on a continuum or hierarchy. At the top of the continuum are proportional systems, which are the "gold standard" and ideal solution, if appropriate. In the middle of the continuum are digital systems that use three or more switches for control and are often necessary for people who do not have the physical or cognitive skills required to use a proportional system. At the bottom, are digital scanning systems, which use a single switch and a scanning array to control the wheelchair. These systems are used as a last resort when all other options have been ruled out. For each client, I consider options at the top of the hierarchy first, and then move down to consider technology in subsequent categories, as options are ruled out. A variety of devices fall within each of the three categories, which can be controlled by various body movements.

Proportional drive controls include joysticks of different sizes, which may require varying amounts of force to activate, or systems that use a body part such as the finger or head to simulate the movement of a joystick. These systems have a 360-degree radius of movement. The speed of the device will increase as you move the joystick (or a body part) away from the neutral position. Proportional controls allow users to make a variety of minute changes in course and speed, making them the "gold standard" because they give the user the most choice and control in terms of maneuverability. However, to operate this system, the user needs smooth, controlled motor movements, an ability to understand the relationship between movement of the proportional system and the chair's response, and an ability to react appropriately. A digital drive control system typically consists of an array of 3 or more switches. Digital systems offer a single response to each hit of the switch. For example, one switch will control forward, another controls left turns, and another controls right turns, etc. Some users feel that a digital system limits their ability to operate the chair in small, confined spaces and make quick and smooth course corrections because there is a limited amount of direction and speed adjustment available. On the other hand, a digital system may be less confusing than a proportional system for some people. To operate digital controls, users need small, isolated, volitional body movements in which they can activate the switches, sustain activation, and release them in a timely manner (Lange, 2008). Scanning is a final option for clients who only have one reliable switch site. In general, the user needs an ability to hit and release a switch quickly (to choose a direction of course on a scanning array), and an ability to sustain activation on that switch to drive the chair in the selected direction. This method of driving is slow and inefficient, but a good option for some users.

Step Four: Preliminary Assessment with Other Tools

If a thorough assessment is conducted in Steps 1-3, the seating team should be able to develop a hypothesis about the type of control system the user might be able to use with success. Step Four of the assessment process involves the preliminary testing of this hypothesis. It is not always easy to find a power wheelchair or a variety of alternative drive control systems for trial; therefore, a preliminary assessment using other types of technology can be useful to help the team further refine their "hypothesis." Using simple technologies such as switch toys, switch adapted appliances, and computer technologies can help the specialist test the client's motor skills further.

For example, if the team thinks a user might be able to use a proportional track pad as a drive control system, the user can simulate this motor task by using the track pad on a lap top computer to draw shapes on a Paint program. For a young client who has the potential to use a digital drive control system, the team can use mechanical switches attached to toys, and assess the child's ability to hit the switches, sustain activation, and release them on command at various sites. These preliminary activities will not determine with certainty if a particular type of drive control system is appropriate for a user, but may help the team gather important information prior to implementing a trial with a power wheelchair.

Step Five: Advanced Assessment; Power Wheelchair Trials

The fifth step in the assessment process involves conducting a power wheelchair trial using a chair that matches the parameters determined in the seating assessment as closely as possible. In addition, the team should have gathered useful information in the preliminary assessment to determine which type of drive control system the client will most likely be able to operate, and where it should be located. During the process of the power wheelchair trial, several factors will need to be assessed, which are discussed further in Step Six. For some users, the team can determine their needs after one trial in a power wheelchair. For other clients, an extended trial and training sessions over the course of weeks or months may be required.

Step Six: Other Factors to Determine/Assess

During the power wheelchair trial, the team will implement Step Six by considering many important factors that affect a user's success. Throughout the trial, the team should determine if the drive control system being used is appropriate or if another option along the continuum should be tried. If the selected device is appropriate, the team must decide where it should be located and how it will be mounted. Specific strategies, control enhancers, or stabilization techniques that might help the user control the device more successfully should also be determined, such as stabilizing a body part for greater control, or modifying the parameters of the chair's electronics.

A second and equally critical aspect of Step Six is the assessment of the client's cognition, behavior, sensory processing skills, and family and community support. Assessing these factors can be very challenging. There are no known tests that can definitively determine if a client has the necessary skill, cognition and sensory processing abilities to operate a power wheelchair safely, although there are assessments and skills tests that can help in the decision making process (Furamasu, Guerrette, & Tefft, 2004). The team considers the results of assessments, along with general observations of the client using the power wheelchair in a variety of environments, to make these decisions.

Step Seven: Power Wheelchair Recommendation

Step Seven begins when the team makes a decision to recommend a power wheelchair for the user. In this step, the team will determine very specific recommendations about the type of chair the client requires, as well as the set-up of the seating, drive control system, and all accessories. Once the team determines these specifications, team members will coordinate responsibilities to ensure that the chair is funded. While the assessment phase is ending, the team's work is far from over. They must work together to ensure the client has a successful outcome through the delivery and set up of the chair, training to the client and caregivers, and periodic follow up. As changes occur within the client, or as the equipment becomes old or damaged, follow up assessment may be required. The assessment process is continuous, and in many cases, it never really ends!

No Power Wheelchair Recommendation

In some cases, clients do not demonstrate the physical, cognitive, or sensory abilities needed to operate a power wheelchair safely. In these situations, the team must determine if the client has the potential to develop proficiency through the practice of specific skills. If the client struggles to use switches, or lacks cognitive skills, the team may want to suggest specific switch activities for practice on a daily basis. In some cases, an extended trial with a power wheelchair may also be appropriate.

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Figure 1: Visual representation of the 7-step process for an alternative drive control assessment.

IC04: Wheelchair Clinic… Design and Structure

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The need for Wheelchair Seating and Mobility clinics became apparent in the mid to late1980's. This was the era of burgeoning manufacturer research and development. With the introduction of "lightweight" wheelchairs, rigid wheelchair frames, fluid cushion technology, modular back supports, custom molded seating and new power mobility breakthroughs, it was difficult for the average treating practitioner to stay up-to-date on the latest wheelchair technology.

Formalized wheelchair clinics evolved initially from client practice and an understanding that the wheelchair is not only a means of mobility and function but also an orthotic device. All of the established clinics of the presenters were started very informally with a "champion" being identified by their peers as the "wheelchair expert". These clinics slowly became more formalized with full time employees (FTE's) designated to the wheelchair clinic, wheelchair technicians hired, equipment storage rooms found and commandeered, written policies and procedures were formulated, and specialty clinics were created. These clinics were born from appreciating the complexity of the wheelchair service delivery process, professional education, and networking with additional clinicians. The marketing and growth of the wheelchair clinic, if it is done well, is achieved by word of mouth from the clients served.

The initial development of a Wheelchair Clinic service is dependent upon many factors including the philosophy of the facility, administration support, the type of clients that a facility serves (spinal cord injury, brain injury/stroke, pediatric/developmental disabilities, special needs school, VA system) and funding sources for these clients.

There are many programming needs when developing a successful and sustainable Wheelchair Clinic. To simplify, we will focus on three programmatic components:

1. Business components which include administrative support and philosophy, decision making structure of the facility and staff, policy and procedures, staffing, resource allocation, freedom of therapy staff for development, collaboration with outside sources such as insurers and suppliers, educational resource dedication for clinical and technical staff.
2. Clinical components which include wheelchair knowledge expertise, mentorship, client-centered care, commitment to the industry, continuing education, documentation, customer service, case management and understanding of funding sources. This becomes challenging as we attempt to encompass more rehabilitation needs at a faster pace.
3. Client components which include individual responsibility and ownership of their equipment and a Wheelchair Clinic designed to support the needs of the population it serves.

As the Wheelchair Clinic becomes more established, the need for specialty clinics within the service for efficiency and expertise become apparent. These off-shoot clinics can include interface pressure mapping (IPM), upper limb joint preservation, Smart Wheel, TELEhealth, wheelchair mobility skills training, and wheelchair maintenance and care training.

Additionally, the collaboration with Rehab Technology Suppliers (RTS's) is also a key component of a successful Wheelchair Clinic. "More so than in other health care settings, suppliers play an integral role in the provision of wheelchairs to clients." (Eggers et all). Most Wheelchair Clinics are providing services to those with complex rehab needs. This necessitates a team approach with a service delivery model versus a sole prescription/recommendation model. This model requires heightened expertise and professionalism of the supplier.

In summary, the evolution of a Wheelchair Clinic is often facilitated by identifying an initial practitioner who is interested in specializing in the provision of wheeled mobility and seating services, administrative backing to support program development, collaboration with RTS(s), strategizing how to maintain a financially viable clinic, and looking for continued ways to expand their service delivery to meet individual clients unique wheelchair needs.

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IC05: Ultralight Manual Wheelchairs:Get it Right, Get it Covered

Robert Meehan, PT, ATP

Introduction

The manual wheelchair has evolved over the years with more options and accessories available to make the wheelchair lighter, stronger and easier to propel. The higher end manual wheelchairs for adults, also known as ultralight wheelchairs, are coded by Medicare as K0005 or K0009. The K0009 is considered a custom ultralight wheelchair that tends to be more expensive than the K0005 and may have frames made of titanium, carbon fiber or magnesium. The ultralight wheelchairs are designed for full time manual wheelchair users as a primary mode of mobility. As a wheelchair user of over 23 years, due to T9 Paraplegia, and through work as a supplier of complex rehabilitation technology and as a physical therapist, I understand the importance of using an ultralight manual wheelchair and how the design of the wheelchair is critical to achieving independence with mobility and self care and creating a safe mobility device. In the assistive technology clinic at Frazier Rehab Institute, in Louisville, KY, every effort is made to provide ultralight manual wheelchairs to wheelchair users striving to be more independent or who require special seat sizes, seat and back angles, seat heights, or adjustability only available with ultralight wheelchairs. The goal of the wheelchair and seating system is act to as an orthosis where it matches the contours of the body, maximize surface area contact and minimize pressure to avoid skin breakdown and improve the mechanical efficiency of self propulsion.

Increased difficulty with insurance funding

Unfortunately, in my experience, insurance approvals for these wheelchairs are becoming increasingly difficult to come by either through ADMC (Advance Determination of Medicare Coverage), prior authorizations through private insurance or through prescreening performed by suppliers internally or through subcontracted private companies. The ultralight wheelchairs are eligible for ADMC as well as group 3 power wheelchairs and tilt in space wheelchairs for adults and pediatrics. ADMC is a prescreening tool that suppliers use to help determine medical necessity where the seating and mobility evaluation and other relevant documentation are reviewed by a Durable Medical Equipment Medicare Administrative Contractors (DMERC or DME MAC). It is no guarantee of payment and is not a prior authorization but serves to review the documentation and provide guidance whether the documentation meets medical necessity guidelines.

The Role of ADMC

It is critical for clinicians and suppliers to understand the specific language of the ADMC process to help their clients receive needed equipment. In the case of an affirmative determination, it does not provide assurance that the beneficiary meets Medicare eligibility requirements nor does it provide assurance that any other Medicare requirements (e.g., place of service, Medicare Secondary Payer) have been met. Only upon submission of a complete claim can the DME MAC make a full and complete determination. An affirmative determination does not extend to the price that Medicare will pay for the item. Finally, the DME MAC may review selected claims on a prepayment or postpayment basis and may deny a claim or request an overpayment if it determined that an affirmative determination was made based on incorrect information. An affirmative ADMC is only valid for items delivered within six months following the date of the determination. A negative ADMC determination may not be appealed because it does not meet the regulatory definition of an initial determination since no request for payment is being made. However, if the ADMC request for the wheelchair base is denied and the supplier obtains additional medical documentation, a new ADMC request may be resubmitted with all pertinent medical documentation and forms. ADMC requests may only be resubmitted once during the six-month period following a negative determination. If the wheelchair base is approved, but one or more accessories are denied, an ADMC request may not be resubmitted for those accessories. If a supplier provides a wheelchair and/or accessories following a negative determination, a claim for the item should be submitted. If new information is provided with the claim, coverage will be considered. If the claim is denied, it may be appealed through the usual process.

Coverage Criteria for Wheelchairs

Per Medicare local coverage determination documents (available through DME MAC websites), a manual wheelchair is only covered for use inside the home when the beneficiary has a mobility limitation that significantly impairs his/her ability to participate in one or more mobility-related activities of daily living (MRADLs) such as toileting, feeding, dressing, grooming and bathing. The mobility limitation must prevent the person from accomplishing an MRADL entirely, places them at heightened risk of morbidity or mortality while performing an MRADL or prevents them from accomplishing an MRADL in a reasonable time frame. The exact definition of "heightened risk" and "reasonable time frame" are not provided and seem to be up to clinicians, providers and suppliers to interpret. Less costly alternatives, like canes and walkers must be ruled out before a wheelchair will be covered. Other requirements for Medicare to purchase a wheelchair include the wheelchair must provide access between rooms and across surfaces in the home, the wheelchair user has not expressed an unwillingness to the use a manual wheelchair and has sufficient upper extremity strength and other physical and mental capabilities to self propel, or a caregiver is available, willing and able to provide assistance with the wheelchair. The LCD directly states…"If the manual wheelchair will be used inside the home and the coverage criteria are not met, it will be denied as not reasonable and necessary". A high strength lightweight wheelchair (K0004) is covered when either the beneficiary self-propels the wheelchair while engaging in frequent activities in the home that cannot be performed in a standard or lightweight wheelchair or the beneficiary requires a seat width, depth, or height that cannot be accommodated in a standard, lightweight or hemi-wheelchair, and spends at least two hours per day in the wheelchair. A high strength lightweight wheelchair is rarely reasonable and necessary if the expected duration of need is less than three months (e.g., post-operative recovery).

Coverage Criteria and Justification for an Ultralight Manual Wheelchair (K0005)

1. The beneficiary must be a highly active, full-time manual wheelchair user.
2. The beneficiary must require individualized fitting and optimal adjustments for multiple features that include axle configuration, wheel camber, and seat and back angles, in addition to ongoing critical support.
3. The beneficiary must have a specialty evaluation that was performed by a licensed/certified medical professional (LCMP), such as a PT or OT, or physician who has specific training and experience in rehabilitation wheelchair evaluations and that documents the medical necessity for the wheelchair and its special features (see Documentation Requirements section). The LCMP may have no financial relationship with the supplier.
4. The wheelchair is provided by a Rehabilitation Technology Supplier (RTS) that employs a RESNA-certified Assistive Technology Professional (ATP) who specializes in wheelchairs and who has direct, in-person involvement in the wheelchair selection for the patient.

With knowledge of Medicare's coverage criteria and knowing the person should be a highly active, full-time manual wheelchair user and that lesser wheelchairs must be excluded, the interpretation of what "highly active, full-time wheelchair user" seems up to the interpretation of clinicians, physicians and suppliers. I typically use at least 6 hours of daily wheelchair usage to be considered a full-time wheelchair user. I would also submit that anyone who uses their wheelchair in the home and community could be considered highly active, especially if they self propel considering the inclines, cross slopes, curbs, curb cuts and uneven terrain that must be negotiated in the community. The ability to perform a wheelie while pushing a wheelchair forward or backward is critical to allowing independence with mobility and negotiating obstacles, and is a skill I use all the time. To perform wheelies while in motion can only be achieved with a wheelchair that has a rear axle that can be moved forward. My axle position is 4.5" forward of the backrest canes allowing for upper trunk and head movements to create a wheelie position while traveling down a ramp or slope. The forward adjustment of rear axles is only available on K0005 wheelchairs. Also, the individual must need customized axle configuration, wheel camber, seat and back angles, seat height, width and depth not available on lesser wheelchairs.

The difference between a K0004 and K0005 that are both folding frames can be more difficult to discern but some common features that are only available on K0005 folding wheelchairs include…

- Fixed front frames (non-swing away legrests or footplates)
- High mount or direct mount footplates to accommodate short lower leg lengths
- Greater range of seat to floor height adjustments to allow foot propulsion or increased posterior angle to the seat
- Greater range with back height or backrest angle
- More variety of wheel sizes, wheel types, tire and caster options to improve propulsion efficiency or accommodate client's dimensions
- Legrest/frame angles greater than 70 degrees and shorter frame lengths to make the wheelchair turn in a smaller space or longer frame lengths to improve stability and prevent the wheelchair from tipping forward

Rigid frame ultralight wheelchairs, in my opinion, have greater differences and more features that are not available on lesser, folding wheelchairs, making the justification of them easier. These include…

- Lighter weight to decrease strain on the upper extremities during propulsion
- Cantilever or L frame style wheelchairs improve the ability to self load of the wheelchair into a car and decrease overall size of the wheelchair frame
- Increased frame strength for more active, community users. Folding frames tend to have greater frame movements during propulsion and the cross frames tend to loosen over time
- Shorter frame lengths for decreased turning radius, improved ability to negotiate and work in small spaces, and decreased tendency of downhill turning on cross slopes when combined with forward positioned rear axle
- Seat and back angles are independently adjustable to improve postural support and create stability for client's who lack control in the legs, pelvis and trunk
- Some rigid frames have considerable options in seat configuration (ergonomic or tapered seat frame, increased frame length), caster position (forward or lateral options for improved stability), or addition of a 5th wheel/caster in the rear that prevents the drag felt from typical anti tippers
- Rigid frames work well with smaller casters that also improve turning space and overall wheelchair footprint
- Easier to incorporate some of the features seen in rigid frame sport wheelchairs like increased wheel camber and fixed components for improved lateral stability and faster turning
- Ability to fix the backrest, caster angle and vertical axle position for decreased weight and increased durability

Problems I have seen in the clinic that complicate or preclude the ability to use a rigid frame ultralight wheelchair include tightness in ankles or knees that prevent the knee flexion and ankle dorsiflexion range of motion needed to sit in a shortened frame length. When encountering tightness in dorsiflexion, a frame angle of 80 degrees or less, with angle adjustable footplate and anti skid components on the footplate is recommended to help keep the feet properly positioned on the footplates. Current use of a folding frame wheelchair can also be a complication since loading of a rigid frame into a car is much different than loading a folding frame. The ability to stand from a rigid frame wheelchair is potentially more difficult since rigid footplates force users to scoot farther forward in their seats or prevent the feet from being directly underneath the body when standing. There are many manufacturers that now offer flip up footplates for rigid frame wheelchairs.

Using recent research and references from the RESNA Position on the Application of Ultralight Manual Wheelchairs that was published in 2012 can help justify the ultralight wheelchairs and clinicians should have a basic understanding of the research. Specifically, there are references that provide evidence that ultralight wheelchairs with adjustable rear axles provide decreased rolling resistance, require less muscle effort to propel, provide increased speed and maneuverability, improved posture, improved wheelchair propulsion efficiency, improved durability, and decreased risk of overuse injury and upper extremity pain. Fortunately, effective March, 1, 2013, K0005 wheelchairs are being considered part of complex rehabilitation wheelchairs and assistive technology by Medicare, which will exempt that code from competitive bidding. Also, all suppliers must have an ATP involved in the evaluation and the beneficiary needs to have a specialty evaluation performed by a licensed/certified medical professional that documents the medical necessity for the wheelchair and its special features. This should help reduce common errors made when prescribing these types of wheelchairs and hopefully improve access of wheelchair users to these ultralight wheelchairs that have so many advantages over lesser wheelchairs.

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IC06: Unsafe at Many Speeds - A Team Approach for a Safer Ride

Tamara J. Franks, MA
Sue Johnson, CPST

Learning Objectives:

At the conclusion of this workshop, participants will be able to:

1. Identify three components of safe transportation of children with special needs including selection, securing and installation.
2. Describe three roles of a child passenger safety technician and mobility adaptation specialist in the transportation evaluation process.
3. Cite pros and cons of using an adaptive medical seat or wheelchair as a transportation device.

A May 2007 Pediatrics study states, Seventy percent of the children [with special needs] were observed as traveling unrestrained or with a restraint that was grossly misused to the extent that it provided no meaningful protection."" This session will identify the components of improving the safe transportation of children with special needs in both adaptive medical seats and wheelchairs. An emphasis will be placed on the roles and expertise of a nationally certified child passenger safety technician (CPST) and mobility adaptation specialist.

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IC07: Does the Evidence Exist for a Wheelchair Skills Training Program?

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Acknowledgements and Disclaimer

Supported by the Office of Research and Development, Department of Veterans Affairs, Health Services Research and Development (grant no. IIR-06-274-1). The views expressed in this article are those of the authors and do not necessarily represent the views of the Veterans Health Administration or the Department of Veterans Affairs.

Background

To help clinicians train wheelchair users to optimize usage, the Wheelchair Skills Training Program (WSTP) has been developed. Although much research has been completed to examine the WSTP, only four randomized clinical trials (RCTs) have been completed. These studies have all had relatively small sample sizes, the participants used their wheelchairs for a variety of reasons, there were a limited number of outcome measures and the follow-up was never more than 3 months post-training.

The current study was a multisite RCT was conducted to evaluate the WSTP on a large sample of veterans with spinal cord impairment (SCI).

Objectives

The objectives of the study were to determine the immediate and long term effects of the WSTP on wheelchair use ability, community participation and quality of life. The objectives of this presentation are to discuss the rationale of the study, to provide an overview of the methods used and to provide a preliminary summary of results.

Methods

One hundred thirty eight veterans were recruited, with 121 completing all training sessions and 109 completing the one year evaluation. Veterans were randomly assigned to two groups: WSTP and Education Control (EC). Evaluations of wheelchair skills, community participation and quality of life were conducted at baseline, post intervention (6 weeks later), and 1 year post-intervention. The intervention was the WSTP which consisted of five one-on-one sessions with a trained therapist to improve wheelchair skills. The EC group met with a clinician for one-on-one sessions lasting 45 minutes for five weeks (one session each week). EC topics included nutrition, prevention of pressure ulcers, prevention of infections, respiratory complications, and exercise. Wheelchair skills were assessed using the Wheelchair Skills Test (WST). A wheelchair datalogger was used to assess usage as an indicator of community participation. The use of questionnaires also measured community participation and quality of life. Some of the specialized tasks that were taught using the WSTP principles included ascending stairs, transfers from floor to chair, car transfers and pool transfers.

Results

The predominantly male (93%) population had an average (SD) age of 45 (13.2) years and had their spinal cord injuries for an average (SD) of 16.4 (12.5) years. The majority of veterans had their spinal cord injuries in the thoracic region. All participants used manual wheelchairs. Participants in the WSTP group had significantly higher WST scores. These were maintained over the course of the one-year follow-up period. In addition, those in the WSTP group had higher wheelchair usage (as measured by the dataloggers) one year after the WSTP intervention. Veterans reported that they felt it was important to personalize their own goals for training, that they were happy to participate in the study and that they would have never attempted to learn the new skills without the help from study team members.

Discussion

Although the results of this study are similar to those of previous RCTs looking at the effectiveness of the WSTP, this study was distinguished from earlier studies in that it was conducted in a veteran population, in participants who all had spinal cord impairments, with a relatively large sample size, with an educational control group, with a more comprehensive set of outcome measures and with a longer follow-up period. Implementing such a program is now needed so that appropriate wheelchairs skills can be achieved by all veterans with SCI.

Outline of Events

Topic	Presenter
Introductions	Groer/Kirby
Background to Wheelchair Skills Program	Kirby
Description of Study and Results	Groer
Discussion	Groer/Kirby

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1. Kirby RL, Smith C, Parker K, MacLeod DA, McAllister M, Rushton PW, Routhier F. Wheelchair Skills Test (WST) Version 4.1 Manual. http://www.wheelchairskillsprogram.ca/eng/documents/WST_Manual_version_4.1.60.pdf. Accessed November 22, 2012.
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IC08: Considerations for Bowel, Bladder and Bathing Management after SCI

Julie Jennings, PT, NCS
Piper Jasin, PT, DPT

Upon completing this course, Attendees will be able to:

1. Appreciate the importance of bowel, bladder and bathing management to the perception of quality of life in individuals with SCI.
2. Evaluate bowel, bladder and bathing DME for their ability to address seating, positioning and functional needs.
3. Assess and recommend appropriate bowel, bladder and bathing DME for individuals with SCI and other disabilities.

Individuals with spinal cord injury (SCI) face multiple challenges due to physical difficulties that impact their independence and satisfaction with life. As of 2010, there were an estimated 265,000 persons living with SCI in the US and 12, 000 new cases added each year. (1) Existing evidence suggests that, within the first year of injury, the paramount quality of life indicator is the ability to walk. However, after the first year of injury, key indicators for quality of life include bowel and bladder management after SCI. (2) (3). The majority of persons with SCI use adaptive aids or durable medical equipment (DME) to increase their ability to perform bowel, bladder and bathing functions. For these reasons, it is imperative that clinicians who recommend and prescribe DME used for bowel, bladder, and bathing management are well versed in the considerations for choosing specific pieces of equipment to maximally promote health and quality of life. This presentation aims to educate practitioners to gain a better understanding of: 1) accessibility, 2) durability, 3) functionality, 4) cost and reimbursement considerations for choosing DME for bowel, bladder and bathing that most closely match the seating, positioning and accessibility needs of the user in his/her home or institutional environment. This will be an interactive presentation that will include case presentations of DME selection for three unique scenarios. This material is developed from best practice guidelines and current evidence-based literature as well as a combined experience of 20+ years of clinical practice. The knowledge gained from this presentation will also benefit other disability groups.

Outline:

1. Background and Significance
   - i. Overview of SCI Bowel Program
   - ii. Unique Considerations for Bowel, Bladder, Bathing Seating in SCI
2. Considerations for Decision Making
   - i. Bathroom Accessibility
     1. General Bathroom Accessibility
     2. Toilet Accessibility
     3. Shower Accessibility
   - ii. DME Equipment Selection
     1. Commode Chairs – Non Custom and Custom
     2. Tub Benches and Chairs – Non Custom and Custom
     3. Rolling Shower Chairs – Custom
        - a. Seat Selection and Prescription
        - b. Accessory Selection (Brakes, Armrest, Footrest, Tire Selection)
        - c. Perineal Access& Alignment with Toilet
        - d. Portability and Home Accessibility
     4. Multipurpose Modular Systems
     5. Tub/Shower Slider Chairs
3. Case Presentation
   - i. Case #1- Tetraplegia
   - ii. Case #2- Paraplegia
   - iii. Case #3- Status Post Skin Flap Surgery
4. Wrap Up
   - a. Individual patient selection dependent on:
     - i. Patient goals
     - ii. Discharge setting and caregiver support
     - iii. Home accessibility
     - iv. Financial Resources
     - v. Patient level of function and barriers to independence
     - vi. Prognosis; expected changes in short term and long term
     - vii. Maximize independence and minimize overuse injury
   - b. No one product meets all needs
   - c. Trial products
5. Question and Answer

Course attendees will be able to email presenters for full PDF file of all slides presented.
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PS1.1: Evaluation of a Physical Activity Monitoring System for Manual Wheelchair Users

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Learning Objectives:

At the conclusion of this workshop, participants will be able to:

1. list three types of wheelchair-related physical activities performed by manual wheelchair users in the community settings using a physical activity monitor system.
2. list three ways smart phones can be used to provide real time feedback about daily physical activity levels in wheelchair users.

Current literature and our previous studies have shown that there is a need for a valid and reliable physical activity monitor system (PAMS) to assess and quantify wheelchair related physical activities in manual wheelchair users (MWUs). Availability of a valid and reliable PAMS can assist clinicians to help end users with leading a healthy lifestyle and preventing secondary injuries.Furthermore, PAMS can be used to collect and study longitudinal physical activity behavior patterns in MWUs.

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PS1.2: Basic Psychometric Properties of the Transfer Assessment Instrument (Version 3.0)

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Introduction

Wheelchair activities, such as transfers, often create excessive loading on wheelchair users' arms which often leads to upper extremity pain and injuries [1, 2]. However, transfer training protocols and skills evaluation vary widely in clinics [3]. For this reason we developed the Transfer Assessment Instrument (TAI) to unify training and evaluation principles and to identify and correct harmful aspects of transfers. The TAI is a simple, Learning Objective and quantifiable measure of transfer technique [4]. It has two parts. In part 1, the transfer is divided into different movement components, including wheelchair preparation before transfer, hand position, and movement patterns during transfer. Part 2 scores the subjects' global transfer performance in the set up phase, conservation techniques, communication and direction of assistance if human help is needed. The TAI was found to be a safe and quick outcome measurement tool that can be easily applied in a clinical setting.

Although the first study on TAI 2.0 yielded acceptable psychometric properties there was wide discrepancy found in the scores for one of the raters compared to the other two raters in the study. Rater feedback alluded to ambiguities in the interpretation of a few items and a need for more in depth training on how to properly administer the tool. The purpose of this study was to refine the scale based on the initial results, repeat reliability testing, and examine in more detail the measurement properties of the refined version of TAI (3.0). We hypothesized that the refinements made to TAI and more in depth rater training would improve the intra- and inter-rater intra-class correlation coefficients (ICCs) and the SEM of the TAI. Also, we hypothesized that the results of the TAI wouldn't be influenced by subject factors.

Methods

Refinement and Training

TAI 1.0 and 2.0 have 29 items (17 items in part 1, and 12 ones in part 2). Based on clinician feedback and the statistical results two items in part 1 that had poor inter and intra-rater reliability were removed. Of the remaining 27 items, 13 items were reworded to make them clearer. In addition to refinements of the scale item wording, a comprehensive training program was developed. The training program included several parts: text instruction, video-based instruction and vignettes. The text instruction describes in detail the meaning of each item, what to look for specifically and how to score it. Decision trees were incorporated to score items that are more difficult to score based on different kinds of scenarios that may be observed.

Testing Protocol

Forty-one wheelchair users participated in the study. Before transfer evaluation, the Wheelchair User's Shoulder Pain Index (WUSPI) was used to measure the participants' shoulder pain intensity [5]. A hand-held dynamometer was used to measure the subjects' grip strength on the non-dominant side in a sitting position as well as elbow flexor and extensor strength in supine [6]. The Modified Functional Reach Test (MFRT) served as a quantified measure for the trunk stability [7]. They were asked to perform up to four transfers while four raters used TAI 3.0 to independently score the participants' transfer skills. Three of the raters were physical therapists and one was a physiatrist. Their clinical experience ranged from one to 16 years.

Data analysis

Every subject's TAI scores, including each item score, part 1 and 2 scores, and final score, were calculated. In part I, each item of 15 items was scored by either "Yes", "No", or "N/A". Yes is 1 point, no is zero points, and N/A which is not applicable is a removed item. The part 1 score is the summation of each item's score multiplied by 10, and then divided by the number of applicable items [4]. The range of the part 1 score is 0 to 10. The 12 items in part 2 were scored on a Likert Scale ranging from 0 to 4. A '0' means strongly disagree, and '4' means strongly agree. The part 2 score is the average of each item's score multiplied by 2.5, so its' range is also 0 to 10. The final score of the TAI is the average of the part 1 and part 2 scores.

Intra-class correlation coefficients (ICCs) were calculated to assess reliability. Standard error measurement (SEM) was calculated to indicate the accuracy and stability of the intra-rater and inter-rater responses. Construct validity was assessed by comparing subject variables (age, type of disability, length of wheelchair use, pain, seated balance, upper limb strength) to the TAI scores.

Results

TAI scores

The group mean of the part 1, part 2 and final scores of TAI 3.0 are 7.04 (±1.44), 7.55 (±1.61), and 7.30 (±1.42) respectively.

Reliability

The inter-rater ICCs of part 1 and part 2, and final scores of TAI 3.0 had a high level of reliability (range from 0.813 to 0.852). The intra-rater ICCs were between high and acceptable levels of reliability (range from 0.735 to 0.878). Most of the items have acceptable to high levels of ICCs (ICCs > 0.6). However, seven items (items 5, 8 and 13 in part 1 as well as items 1, 2, 3, and 4 in part 2) had weak to moderate levels of intra- or inter-rater ICCs.

Standard error of measurement (SEM)

Intra- and inter-rater SEMs for all items in TAI 3.0 were 1.83 and 1.68 respectively, and the SEMs in TAI 2.0 were 2.24 and 2.41. The SEMs for a majority of the items on TAI 3.0 (20/22 that were applicable items) were lower than the SEMs for TAI 2.0 indicating that refinements and training reduced random measurement error in the scores.

Validity testing

There were no significant associations found between subject variables (age, type of disability, length of wheelchair use, pain, seated balance, upper limb strength) and the TAI scores. Spearman rho coefficients comparing the demographic characteristics, strength and balance data to the final TAI score ranged from -0.13 to 0.25 ($p \geq 0.11$)

Discussion & Conclusion

Our refinements and training program improved the reliability and stability of the responses on the TAI. The TAI 3.0 has higher inter- and intra-rater reliability, and better response stability than the previous version. The TAI proved to be suitable for clinicians with different levels of experience and specialties. The TAI score is a pure reflection of technique and is not biased by the subject's age, type of disability, strength, balance, shoulder pain, wheelchair use, and number of transfers per day.

While reliability for part 1, 2 and final scores on TAI were very good, some items (three items in part I: 5, 8, and 13 and four items in part II: 1, 2, 3, and 4) had moderate to weak ICCs. Some ambiguous situations and the complexity of the items could have influenced raters' decisions on these items. These points are now included in the text instructions and training program for how to score these Items. Another factor affecting these items might come from the subjects. Subjects were more familiar with the transfer environment the second time around and may have become more efficient or smarter in their transfer approach.

We found that for a majority of items the SEM of TAI 3.0 is smaller than TAI 2.0. These results indicate that TAI 3.0 has less random measurement error and will be more sensitive to detect differences in transfer skills among subjects than TAI 2.0. A good clinical assessment tool should be both reliable and valid [8]. The results show that the subjects' demographic data, levels of SCI, shoulder pain index, upper extremity strength, and sitting balance were not correlated with the final TAI score. The results further support TAI 3.0's construct as a true measure of transfer technique. For example, subjects with high TAI scores did not have any less or greater pain, were not younger or older, weaker or stronger, than those who had lower TAI scores.

The TAI proved to be a true measure of transfer technique and was unbiased by certain physical characteristics that may influence transfer. Future studies will associate TAI scores with biomechanical data to further validate the tool's primary function: to reduce upper limb joint loading through good transfer practices.

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PS1.3: Investigating Activity-Related Sonographic Change in Wheelchair User's Shoulder

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Learning Objectives

- Participants will be able to identify how the ultrasound can be used to study the mechanism of shoulder impingement and dysfunction among manual wheelchair users
- Participants will learn how upper extremity tasks and muscle fatigue affect the acromiohumeral distance (AHD)
- Participants will be able to differentiate which subject-related characteristics have greater relationship on AHD narrowing

Introduction

Manual wheelchair users (MWUs) are at a high risk for subacromial impingement syndrome (SIS). Approximately 31-73% of MWUs have shoulder pain, which is believed to be associated with SIS due to repetitive weight-bearing activities such as wheelchair propulsion, weight relief raises, and transfers (1). Studies of non-wheelchair users have shown that fatigue of the RC muscles reduces their ability to stabilize the humeral head against the glenoid cavity of the scapula, causing migration of the humeral head into the space (3, 6). However, it is unclear if wheelchair related weight-bearing activities cause compression of the subacromial space and what other factors such as pain, pathological deficits or fatigue may be associated with unwanted superior translation of the humeral head (5).

The primary purpose of this study was to investigate initial and acute changes (i.e. narrowing) in AHD after wheelchair users performed repetitive weight-relief raises (global fatigue protocol) and an isolated RC exercise (local fatigue protocol) to self-perceived fatigue. A secondary goal of this study was to examine the relationship between shoulder pain, subject characteristics, and AHD. A better understanding of these relationships may help to elucidate mechanisms leading to subacromial impingement in wheelchair users and enable tailored therapeutic interventions that preserve upper limb function.

Methods

Twenty-three MWUs underwent ultrasound imaging of the non-dominant shoulder in a neutral position and pre-post WR and ER exercises to self-perceived fatigue. Joint analysis of spectral amplitudes using surface electromyography (EMG) data from infraspinatus, sternal pectoralis major, lattismus dorsi, and triceps was used to assess Learning Objective signs of muscle fatigue (4). Paired t-tests were used to determine changes in the AHD pre-post activity. Spearman correlational analysis was used to assess the relationships between pain, subject characteristics, and the AHD measures.

Results

The AHD in the first weight-relief position (10.00 ± 1.51 mm) was significantly smaller than the AHD in the baseline shoulder neutral position (11.77 ± 1.83 mm, $p < 0.01$). Greater AHD percentage narrowing was found after repeating the WR exercise among participants with EMG signs of sternal pectoralis major muscle fatigue (-0.47 ± 0.35, $n = 7$). Baseline AHD was related to subjects' shoulder circumference ($r = 0.42$, $p = 0.044$). Individuals with increased years of disability had more AHD percentage narrowing after WR ($r = -0.54$, $p = 0.008$). Increased shoulder pain on the Wheelchair Users Shoulder Pain Index and scores on the OMNI pain scale were associated with AHD percentage narrowing after ER ($r = -0.41$, $p = 0.007$ and $r = -0.59$, $p = 0.003$ respectively).

Conclusion

The results support clinical practice guidelines that recommend MWUs limit weight relief raises to preserve shoulder function (2). The associations found between pectoralis major fatigue, pain, long-term wheelchair use and narrowing of the AHD provide insight into potential mechanisms of subacromial impingement syndrome among manual wheelchair users. The findings indicate the efficacy of quantitative ultrasound to identify changes in the AHD. This could be helpful in evaluating the impact of clinical interventions such as wheelchair propulsion or transfer training on preserving the subacromial space in future studies.

Acknowledgements

This material is based upon work supported by the Department of Veterans Affairs Rehabilitation Research and Development Service (Project Number: B6789C) and the Paralyzed Veterans of America. This material is the result of work supported with resources and the use of facilities at the Human Engineering Research Laboratories, VA Pittsburgh Healthcare System. The authors have no conflict of interests to disclose. The contents of this abstract do not represent the views of the Department of Veterans Affairs or the United States Government.

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PS1.4: Development and Evaluation of New Versions of Seated Posture Measurement Tools

Takashi Handa
Hideyuki Hirose
Shingo Aita
Hirohide Demura

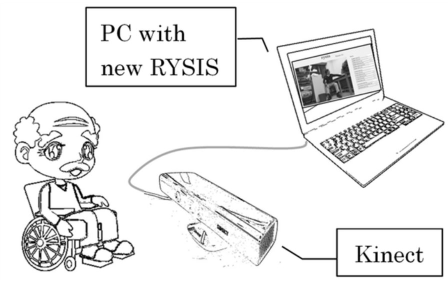

Fig.1 New RYSIS system

Fig.2 The interface screen

Introduction

In the clinical setting, there is a need to be able to quantify the change in posture of an individual which occurs after seating technology intervention, or over an extended time during use of the device [1]. For quantitative seated posture measurement (SPM), the ISO16840-1 standard which defines terms and measurement rules of seated posture was established in 2006. In response to this, we developed 2 kinds of tools for clinical SPM according to the standard. One is 2-dimensional image analysis software proprietary for SPM called RYSIS [2]. Another one is a contact-type measurement device named HORIZON [3]. Although these tools have been used in clinical settings especially in Japan, they have some problems such as “complicated to use”, “expensive” etc. The purpose of this study is to develop and evaluate new versions of RYSIS and HORIZON which can solve these problems. The concept of development is “More Clinically Friendly!”

Method

Development of new version of RYSIS: When using the existing RYSIS, a user (an examiner) has to take a minimum of 3 pictures (sagittal, frontal and transverse) to complete SPM. Furthermore, the examiner must attach markers or put “indication sticks” on body landmarks of a wheelchair user when the landmarks are hidden by clothes. To solve these problems, Dr.s Handa and Hirose developed a new version of RYSIS, which is used with Microsoft Kinect (Fig.1 and Fig.2). As the Kinect has depth sensor, image sensor and the function to track human skeleton, you can detect the 3-dimensional coordinate values of prescribed 20 body landmarks dynamically without markers. From these detected coordinate values, the new version of RYSIS calculates the body angles according to the ISO16840-1 standard automatically and dynamically. Additionally, we developed a function to estimate the location of non-prescribed body landmarks from the location of prescribed landmarks.

Development of new version of HORIZON: The currently existing HORIZON has reliable and highly accurate sensors in it. These sensors are individually adjusted to minimize the instrumental error before shipping, however they the HORIZON expensive. For simple and convenient SPM, Aita and Dr. Demura (Aizu University) developed a simulated HORIZON on an iPhone and iPod touch (Fig.3 and Fig.4). This also uses a pair of outriggers like those on the existing HORIZON. One can measure body angles by contacting the outrigger to designated body landmarks because the iPhone and iPod touch have built-in sensors such as gyroscopes and accelerators, and can calculate the angle (for more convenience, you can measure some of body angles without outriggers). As Tablet PCs including smartphones have gained world-wide use, such popular devices are appropriate to use as alternative measurement equipment.

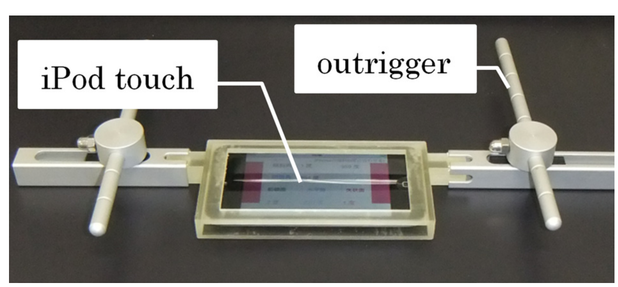

Fig.3 Simulated HORIZON

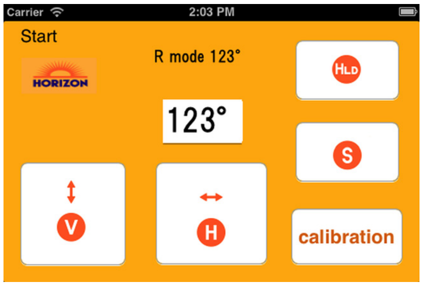

Fig.4 The interface screen

Discussion and Conclusions

From our evaluation (not completed at this time), we found some limitations of these tools in accuracy, reliability and validity. However, the limitations were in an acceptable range for SPM in a clinical setting and we believe that "More Clinically Friendly Tools" are needed for SPM.

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IC09: An Introduction to Economic Evaluation of Health Care Interventions

Bryce S. Sutton, PhD

Program Learning Objectives

At the conclusion of this workshop, participants will be able to:

- Distinguish between three different types of economic evaluation.
- Identify and classify relevant costs of a health care technology or identify and classify relevant costs of a technology or intervention.
- Interpret the results of a cost-effectiveness analysis.

Economic evaluation is an accepted method in the appraisal of health care interventions that is increasingly being used by private and public sectors to determine reimbursement, coverage, and funding decisions. In the wake of recent US government health care reform, comparative-effectiveness and cost-effectiveness evaluation will play a greater role in the adoption of health care technologies. Despite the emphasis on comparative research and the budget impact of health interventions and technologies, there is a paucity of economic evaluations in the rehabilitation literature.

Economic evaluations seek to add the dimension of cost in addition to intervention effectiveness to answer questions in the direct comparison of alternative treatments or technologies, for example:

1. if two treatments are equally efficacious which treatment option should be chosen,
2. if one treatment is more efficacious, is the added effectiveness worth the additional cost,
3. if one treatment is less efficacious is the reduced effectiveness acceptable given the lower cost.

The answers to these questions directly affect decisions made by providers and the quality of care for patients. In this 75 minute instructional course participants will learn about the different types of economic evaluation with examples gleaned from the rehabilitation literature, focusing on the interpretation of results and a discussion of the implications for patient care. Upon completion of the course participants should be able to distinguish between different types of economic evaluation, identify relevant costs and classify costs according to the perspective of a patient, provider, or society as a whole. Examples of cost-effectiveness and cost-utility data will be presented and emphasis will be placed on the use of cost-effectiveness results to guide health care decision making. This course assumes no previous knowledge in health economics.

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IC10: Posture and Postural Tendencies: What's the Difference?

Thomas R. Hetzel, PT, ATP

Introduction

Is it possible that one can have good posture, but an unfavorable postural tendency?

What exactly is good posture? What is meant by postural tendency? It is curious how this author sometimes finds experienced seating professionals at a loss when they are asked what posture is, what it should look like, and what it should do for someone. In addition to posture, what is meant by a favorable postural tendency? How are posture and postural tendency related? This paper accompanies the presentation and is a reflection of this author's clinical and design experience in the field of wheelchair seating and mobility. Missing from this paper are good proven tools for measuring the variables presented below, and sound peer-reviewed research to substantiate the claims. It is hoped that this paper and accompanying presentation will generate ideas and questions that could help in the development of such tools and studies. Enjoy!

Posture

First, let's explore the word "posture", and what may be meant by "good" posture. One dictionary definition of posture is attitude or position of body. This falls short of being valuable when describing seated posture of wheelchair users. Is posture static or dynamic? The dictionary definition doesn't ring of dynamic properties. It may be more beneficial to ask what good posture is for. When asked that question, seating professionals are much quicker in response, and, for the most part, express some idea that posture is the body alignment that gets the job done. But when asked what it should look like, the responses are slower and less consistent. When broken down further as to what jobs need to be done, responses quickly align themselves about three distinct categories of jobs, or activities: rest, fine motor, and gross motor.

Postural definition begins to ease when narrowing the description of posture relative to a task. Rest is clearly one task accomplished in sitting. To physically rest is to release intrinsic muscular control and relax into support. The able-bodied have numerous strategies for accomplishing this, very few of which a seating professional would deem acceptable for a wheelchair user. Why is that? Everyone, able-bodied or otherwise, frequently tends to relax into what could be described as generally "bad" posture, often times exhibiting slouched and asymmetric postures, whether they are standing or sitting. Standing in asymmetry has clear benefits for one wishing to rest while standing. By shifting weight over one hip, and winding that hip into its closed-packed position, the stander experiences greater stability. Additionally, the act of doing so places the pelvis at an oblique angle to the horizon, a pelvic obliquity, and further results in compensatory lateral curvatures of the spine. This lateral bending or flexing of the spine is done to right the head and keep the body's center of gravity balanced over the base of support. The lateral flexing of the spine is biomechanically linked to spinal rotation. This lateral flexion and rotation of the spine brings the facet joints of the spine into proximity, thereby reducing range of motion and increasing spinal stability. Yes, the active movement into asymmetry at the hips and spine results in a more stable alignment. In standing this allows one to relax with a relatively stable posture requiring little muscle activity. It is normal to shift into these asymmetric postures to create stability for rest. It is harder to create this degree of stability in sitting as the stability gained by winding up the hip into the closed-packed position is lost when the hip flexes for sitting.

A quick observation of the postural alignment of people wishing to relax and exert minimal energy will reveal a very broad variety of alignments, but, rest assured, the majority of them are asymmetrical in nature. Outside of military formations, one is hard pressed to find a place and time when people are standing upright in symmetrical alignment. This simply is not "normal". Why is it then that seating professionals strive so diligently for perfect symmetrical alignment for their clients, yet fail to impose the same demands on themselves? Why is it considered pathological for a person with a disability to sit, or stand, in asymmetrical alignment? The answer may be found not so much in the normal pursuit of asymmetry for stability, but the habitual passive collapse or active movement in one persistent direction for stability that a person with a physical disability may tend to exhibit. Simply put, both able-bodied and those with disabilities seek asymmetry for postural stability at rest, and this is normal. The persistent and consistent collapse or movement into asymmetry in one specific destructive pattern is a source of pathology for all! That is right - even the seemingly able-bodied face debilitating change over time if they succumb to consistently poor and destructive postural habits. The key for able-bodied individuals is to maintain the ability to move through midline into a variety of complimentary postures and to maintain muscular balance and flexibility. The key for those with physical disabilities is the same, but is complicated by the loss or impairment of neuromuscular control and the associated and elevated risk of deterioration of musculoskeletal flexibility, balance and alignment. It is, therefore, imperative that everything be done to maintain, restore and improve one's ability to move or be moved through midline in order to preserve the ability to rest at midline.

The position stated above supports the rationale behind the prioritization of a nondestructive resting posture as a paramount goal for people with physical disabilities. If one consistently and persistently, for extended periods of time, collapses or moves into asymmetric postures for rest, without complimentary movement through midline, or neutral alignment, to an equal but opposite alignment for rest, he will experience adaptive changes over time that will further limit flexibility, effect structural change, reduce mobility and ultimately lead to further loss of mobility and deterioration of health. It may also be said that a wheelchair alone will likely not ward off the gradual deterioration into this scenario. So what is the role of the wheelchair and seating in the battle against destructive postural tendencies?

Postural Tendency

What about postural tendency? Firstly, what is tendency? Tendency refers to a way in which something will likely behave, move, or react. How do you predict a tendency for movement? How does something go from a tendency for movement to actual movement? Which is easier, getting something to move or keeping something moving? What is the implication for seating? It is this author's experience that attention solely to posture without the creation of a favorable tendency is a primary reason for wheelchair seating failures. How do we fix this?

There are 2 issues relative to tendencies in wheelchair seating. The first is postural tendency, or the predicted direction of pelvic rotation at rest. The second is the expected tendency of movement within the chair, i.e.sliding. At rest, there are three potential rotational movements possible at the pelvis:

1. Posterior
2. Anterior
3. Lateral/rotational (which is always coupled with anterior or posterior)

To achieve a desirable non-destructive resting posture, a posterior tendency is needed. This in no way means we want a slouched posture with severe posterior tilt and associated kyphotic spinal posture. Instead, it refers to the need for optimal alignment with a tendency to rest into a back and head support (if indicated). A slight anterior pelvic tilt with normal spinal curves is desirable, but must be accompanied by a posterior tendency so that people can relax into their postural supports.

Posture and Tendency

Here comes the challenge. Resting back against a back support creates the undesirable but inevitable tendency to slide out of the chair. That's right, success with the postural alignment and tendency goal results in a corresponding tendency to slide out of the chair. If that tendency to slide is greater in magnitude than the forces present to resist that tendency, then, yes, people will slide out of their wheelchairs. One must create a desirable postural tendency, and resist the corresponding tendency to slide. How, then, do we prevent the tendency for sliding from becoming actual movement? The answer is to use pressure and shear! Everyone agrees, however, that pressure and shear are contributors to the potential for skin breakdown. The solution is selective application of pressure and shear to areas of the body tolerant of these forces, and elimination of the forces of pressure and shear at high risk areas. Judicious application of pressure and shear at key and preferably weight-bearing surfaces is necessary not only to improve postural alignment, but also to prevent sliding. Orthotists and prosthetists have used these principles successfully for decades in their practices. A touch of these tried and true principles in seating will likely boost seating outcomes considerably. Experience has shown that application of these principles in support of resting postures typically creates the foundation needed for fine motor and gross motor activities with minimal to no loss of core alignment.

Conclusion

In summary, the use of seating systems that lack accurate contour and orientation for postural correction, or which utilize materials that are inherently unstable or slippery will hinder the potential for favorable postural and functional goals. Use of firm materials with high coefficients of friction, but accurate shape, with resultant elevation of supportive forces at areas of the body tolerant of pressure and shear is preferable, and may provide suitable "lift" to allow for removal of those forces from at risk areas. The end result is optimal alignment with a posterior tendency at rest, and significant resistance to sliding out of the chair while simultaneously providing a higher level of skin protection at high risk areas. Achieving this Learning Objective also creates a platform for fine and gross motor function with minimal to no loss of core alignment, and subsequent reduction in the need for repositioning. Consideration of this approach will hopefully spawn considerable discussion and debate and lead towards better interventions and improved outcomes measurement.

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IC11: Consumer Organization Leaders Share Insights of a Sustainable Consumer Movement - A Panel Discussion

Ann Eubank, LMSW, OTR/L, ATP, CAPS
David Estrada
Jessica Harthcock
Nick Libassi

Learning Objectives

At the conclusion of this workshop, participants will be able to:

- State a definition of peer support.
- Identify three aspects of empowerment gained from involvement with a peer organization.
- State three actions within clinical practice guidelines that will increase the opportunity for consumer empowerment.

This panel of consumer organization leaders will discuss the elements of a successful and sustainable consumer movement. This is a rare opportunity to gain insight to the necessary components, challenges and achievements of a consumer-run organization whose mission embraces increased independence for its members including access to seating and wheeled mobility.

IC12: World Health Organization Wheelchair Service Training Package

Sarah Frost, PT
Chapal Khasnabis

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Describe in what geographic, political, economic and social contexts the program is likely to be the most successful.
2. Participants will be able to describe at least three features of the training approach for basic service provision.
3. List three differences in intermediate level service provision.

Statistics show that less than 5 percent of those in need of a wheelchair actually have access to properly fitted wheelchairs. The Wheelchair Service Training Package is intended to support the training of personnel fulfilling the clinical and technical roles in a wheelchair service (described on page 105 of the Wheelchair Guidelines) at basic and intermediate level. WHO hopes to see the Wheelchair Service Training Package delivered as both a stand-alone short course for personnel already working in the field; and integrated into the curricula of rehabilitation personnel training programmes.
Faculty:

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IC13: Following Through: Assessment and Training After Wheelchair Delivery

Theresa Berner, OTR/L, ATP
Tina Roesler, PT, MS, ABDA

Learning Objectives

1. Understand the most common service delivery model for mobility equipment.
2. Identify at least three wheelchair adjustments that may impact clients' ease of propulsion.
3. List important reasons for follow through after equipment delivery.
4. Learn tracking methods for clinical outcomes that will help make you more productive.

We speak a lot about wheelchair and seating assessment. How to complete a thorough evaluation, work with the team to assess, choose, justify and order the most appropriate mobility and seating system. The process sometimes seems cumbersome and often frustrating. After all, while clinicians and suppliers have the needs of the client in mind, they are also pressured to increase productivity and manage their time. So – once the mobility system is delivered, we can all breathe a sigh of relief, pat ourselves on the back, and send the happy client on their way….Right?

Not so fast! A critical component to mobility and seating success is follow-through after the delivery. This presentation will take a step-by-step look at the post-delivery process. It will discuss alternate service delivery models for final wheelchair fitting and show clinical examples of just how successful follow-through after the delivery can be.

From the time the client sits in the new chair, until they leave the clinic for the final time, the team should be identifying areas for improvement and working together to achieve the client's goals. We should not look at "wheelchair clinic" as simply an assessment and provision system – we should look at the long-term implications of equipment choices and establish a plan of care with measurable and attainable goals. Those goals can relate to the fit of the chair, postural changes or challenges, mediation of secondary complications such as skin concerns, chronic pain, fatigue, or orthopedic complaints as well as the client's specific functional goals related to their daily living.

Whether over several visits or just one or two, this will give the client ample time to acclimate to the new equipment in a more controlled setting. It will increase productivity for clinicians save time for the suppliers. We will discuss assessment, training, and client education and have we can achieve positive outcomes for clients while still running a productive mobility and assistive technology clinic.

Common Assessment Procedures to Perform for Determination of Adjustments for successful manual propulsion and use:

1. **Set up and fit of the chair**
   a. Clinical Practice Guidelines;
      i. www.pva.org
      ii. www.scipg.org
   b. Manual wheelchair training:
      i. Manual Wheelchair Configuration and Training: An Update on the Evidence 2012; http://www.interprofessional.ubc.ca/iss/documents/Syllabus.pdf

2. **Pressure Mapping**
   a. NPUAP; http://www.npuap.org/resources.htm
   b. PVA Pressure Ulcers: www.pva.org
   c. Pressure Mapping Guidelines:(Page57) http://www.iss.pitt.edu/ISS_Pre/ISS_Pre_Doc/ISS_2011.pdf

3. **Wheelchair Skills Test; Kirby http://www.wheelchairskillsprogram.ca**
   a. Wheelchair Skills Program
   b. Wheelchair Skills Test

4. **Smart Wheel Analysis; http://www.out-front.com/smartwheel_overview.php**
   a. Push Forces
   b. Push Frequency
   c. Push Length
   d. Push Smoothness
   e. Speed

5. **Propulsion Analysis**
   a. Set distance, use a timer and count pushes
   b. Document propulsion pattern
   c. Use observation skills

6. **Center of Mass Assessment**
   a. Distribution of weight on casters and wheels
      i. Rolling Dynamics: http://www.iss.pitt.edu/ISS_Pre/ISS_Pre_Doc/ISS_2011.pdf page 255
      ii. Rolling resistance of manual wheelchairs: Sauret,C., Bascou,J., et al. (2012) Assessment of field rolling resistance of manual wheelchairs. JRRD.Vol 49 (1),pages 63-74. Found: www.rehab.research.va.gov/jrrd/index.html

7. **Core Stability training**
   a. Liemohn,W., Baumgartner, Gagnon,L., Measuring Core Stability. Journal of Strength and Conditioning Research, 2005, 19 (3), 583-586.
   b. Akuthota,V., Ferreiro, Moore, T., Fredericson,M. Core Stability Exercise Principles. Curetn SportsMEdicine Reports. Volume 7 (1). January/February 2007.
   c. Chaudhari,A., McKEnzie, C.S., Borchers, J.R., Best, T.M. Lumbopelvic Control and Pitching Performance of Professional Baseball Pitchers. Journal of Strength and Conditioning Research. Volume 25 (8) August 2011

Program support and Guidance

1. RESNA Position Paper on Service Delivery and Application of Manual Wheelchairs
   a. www.resna.org/resources/position_papers.dot
2. CMS LCD and CPT code description
   a. http://apps.ngsmedicare.com/applications/lcd.aspx?CatID=3
   b. http://www.ngsmedicare.com/wps/portal/ngsmedicare
3. Outcome Assessments: FMA and QUEST
   a. Lenker, J., & Paquet, V. (2004). A new conceptual model for assistive technology outcomes research and practice. Assistive Technology, 16(1), 1.
4. Conference Proceedings
   a. Service delivery: http://web.resna.org/conference/proceedings/2012/StudentScientific/PublicPolicy/SEATINGANDMOBILITYSERVICEDELIVERYPROCESS.html

IC14: Hindsight is 20/20: How the past can enhance the future of wheelchair seating

Diane B. Thomson, MS, OTR/L

Learning Objectives

- Describe three aspects of a team approach for determining appropriate equipment needs
- Identify the necessity of transparency in equipment choice to indentify funding issues
- Describe the educational benefit of a retrospective case study review

Abstract

Looking at the evolution of wheelchair seating clinics for future development, one must look at multiple aspects including design of the clinic; funding and trends in procurement of the equipment; and qualified professionals working with complex rehab technology.

With many different clinic designs throughout the country, it is easy to get overwhelmed in the "proper" way to conduct a clinic. By using a client centered approach and the proper team, a client can receive a comprehensive evaluation and well fitting functional wheelchair. This team should be knowledgeable in multiple diagnoses with a creative, problem solving mind set. Knowledge of equipment available or the ability to design parts in collaboration with manufacturers or engineers is essential especially with complex diagnoses. Past methods of fabrication vs. use of newer off the shelf options can be used to address all clients' needs. These concepts can lead us to future design and protocols for seating clinics from a clinical perspective.

Funding issues can affect the choices of equipment available to the client. Current guidelines and reimbursement make addressing the client's needs an increasing challenge. It is important to provide transparency in equipment options allowing the client to advocate and address these barriers. With this in mind, looking at how funding has changed through the years can provide a mechanism for change.

Clinician presence with appropriate interventions is essential to meet the clients' equipment needs. Retrospectively reviewing case studies, collaboration with peers and a creative thought process will allow for educating clinicians as specialists in wheelchair seating for the future. This will also insure the ability for clients to have a functional wheelchair which is fit to their specific needs and lifestyle.

A literature review was completed for clinic design, protocols for client populations, current funding issues and clinician education. These aspects will be combined with looking at two wheelchair seating clinics in separate areas of the country which provide services to clients with multiple diagnoses. Utilizing a literature review, survey and case study format, we are addressing the process for continued program development as well as education for current and future clinicians.

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IC15: Back Support: Keystone to Seated Function and Physiology

Stephanie A. Tanguay, OTR, ATP

keystone is something on which associated things depend for support. In any seating system, the back support is the keystone on which posture, pressure physiolgy & function depend. Understanding the relationship between the pelvis and spine is the basis for comprehending the asymmetries and orthopedic changes which can occur in seated posture. For example, if the consumer sits kyphosed or oblique with a scoliosis, we determine if the orthopedic change is fixed or flexible. Based on that, the approach is accommodation of posture or correction. 2+2 = 4, or so it would seem.

From the initial wheeled mobility experence, consumers' lives are impacted (positively or negatively). In many rehabilitation settings, close attention is paid to the wheelchair prescription. Several different mobility bases may be trialed and a variety of seat cushions may also be evaluated. Just as important, perhaps even more important in the assessment process is the back support.

In 1988, Shields and Cook examined the effects of both seat angle & lumbar support on the seated buttock pressure of 20 able-bodied individuals. They found that the use of lumbar support reduced the seated pressure at the ischial tuberosities. Since then, other studies with able bodied and non-able bodies subjects have supported those findings (Makhsous, et al, 2003, Sprigle, S, Wootten, M. et al). My own experience as a prescribing clinician and as a rehabilitation technology supplier further validated these published findings. In discussions with consumers and consumer-providers with the field, I continue to hear similar philosophies.

The pelvis is undisputedly the basis of seated support. Structurally it is the point of primary interface with the wheeled mobility device. But the pelvis is not alone; the lower extremities provide increased stability and weight distribution while the torso and upper body extend vertically from the pelvis with 360 degrees of possible deviation. Pelvic stability is not simply from a contoured seat surface. For the vast majority of consumers who utilize wheeled mobility devices, some type of posterior support is required.
Stabilizing the pelvis requires applying support at the level of the posterior superior illiac spine. In most instances, failure to apply contact at the PSIS would mean the back support was above the pelvis allowing room for the consumer's pelvis to rotate anteriorly and possibly to slide posterly (beneath the back support). When the PSIS and lumbo-sacral spine is stabilized, additional parameters must be accessed and specified.

Back support angle influences trunk stability in the sagittal plane. The majority of 'after-market' rehab focused back supports have some amount of angle adjustment via the mounting hardware. The amount of back angle (open or closed from a 'neutral' 90 degree orientation) will have a direct bearing upon static & dynamic trunk stability and therefore many functional activities.

Back support height also affects stability in the sagittal plane. The shape of the top of the back, the contour through the vertical aspect of the back support and the orientation of the back support in relation to the vertebral levels and scapula all impact the spinal alignment orientationof the body in the saggittal plane. If the back height is too high, the consumer may be unable to sit with an upright posture. Their upper trunk may be forced anterior. A back height that is too low may not provide adequate thoracic support and the consumer's upper body may fall over the back support with the head and shoulder girdle moving posterior of their pelvis. Back support circumference determines trunk stability in the coronal or frontal plane. Back supports are available in planar and contoured variations. The consumers' thorasic radius can be matched to a similar back support radius with consideration for the amount of lateral thoracic support the individual requires.

Poor seated posture can lead to orthopedic issues, but keep in mind that there is much more going on than structural changes. Seated posture influences physiological systems; respiration, digestion, circulation, bowel and bladder function, skin integrity and active range of motion can all be effected. Research has identified the importance of seated posture to all of these bodily functions.

Posture also impacts the performance of functional activities such as propulsion and transfers. In addition, skin integrity is impacted by pressure distribution and is also dependent upon physiologic systems to maintain or regain that integrity. All aspects of posture, support, pressure and function must be considered in the equipment selection process. Because these factors are interrelated and often influence each other, it would be shortsighted to think of seating & positioning as simply 2+2=4. Understanding the relationship between the pelvis and the spine is crucial to maximizing the benefit of the cushion as well as the mobility equipment.

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IC16: Introduction to the Wheelchair Clinic: An Interactive LIVE Assessment!

Steven Boucher, OTR/L

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify at least three key areas to address during the interview session of the assessment.
2. Identify four key measurements of the client to help determine product prescription.
3. Understand three components of a Letter of Medical Necessity when applying for funding of products.

This interactive class is designed for an audience that is new to the wheelchair evaluation process. Attendees will be asked to participate in a simulated wheelchair clinic evaluation with an actual end-user. Discussion and participation with the interview, prescription and documentation process will be the focus.

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PS2.1: The Effect of Optimal Positioning for Pressure Relief in Functional Activities

Scott D. McPhee, DrPH, CPAM, OTR/L, FAOTA

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify how optimal pressure relief may have an effect on an individual's ability to perform functional tasks.
2. Utilize research methods to teach occupational therapy students how to conduct clinical research.
3. Explain three potential fall risks associated with functional reach.

The purpose of this pilot study was to determine the ability of individuals to perform functional activities while seated in a wheelchair in the suggested optimal pressure relief position. Each of the twelve, able-bodied participants completed four activities in the optimal pressure relief position. Optimal pressure relief was achieved by positioning the wheelchair in 120 degrees of recline and 45 degrees of tilt. Upon completion of each activity, the participants were asked to rate the perceived level of exertion using the Borg's Rating of Perceived Exertion.

The findings indicate that all participants were able to complete at least 50% of the activities. Three participants (25%) were able to complete all four activities, seven participants (58.33%) were able to complete three activities, and two participants (16.66%) were able to complete two activities.

The results of this study suggest that the optimal pressure relief position does have an effect on an individual's ability to perform functional activities; however, further research is needed to validate these results.

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PS2.2: Inflammation in Individuals with SCI with Pneumonia and Pressure Ulcer Incidence

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Rami Namas
Ana Allegretti
Gwendolyn A. Sowa
David M. Brienza

Background

Spinal cord injury (SCI) is a devastating neurologic disorder that has profound influence on modern society from physical, psychological, and socioeconomic perspectives (Dumont et al., 2001). Pressure ulcers are one of the most serious secondary complications after a spinal cord injury (McKinley, Jackson, Cardenas, & De Vivo, 1999). Fifty to eighty percent of individuals with SCI develop pressure ulcers at least once in their lives (Stover, DeLisa, & Whiteneck, 1995). A 39% pressure ulcer prevalence rate was reported for veterans with SCI (Garber & Rintala, 2003). The formation of pressure ulcers after spinal cord injury increases the length of stay and also increases re-hospitalization (Cardenas, Hoffman, Kirshblum, & McKinley, 2004; New, Rawicki, & Bailey, 2004). Pneumonia is the most frequent respiratory complication in individuals with spinal cord injury along with atelectasis and respiratory failure (Tollefsen & Fondenes, 2012). Pneumonia causes inflammation of the lung tissue due to infection (Jackson & Groomes, 1994). The incidence of pneumonia increases for individuals who are on mechanical ventilation within four days of intubation. (Ball, 2001). Inflammatory cytokine levels are increased in individuals with both pneumonia and pressure ulcers (Stechmiller, Kilpadi, Childress, & Schultz, 2006; Yende et al., 2005). Although pneumonia and pressure ulcers are addressed separately in the literature as complications of SCI, an association between them has not been explored (NSCISC, 2006).

Aims

1. To analyze the association between the presence of pneumonia and incidence of pressure ulcers in individuals with SCI in the RERC population.
2. To identify the inflammatory cytokines (pro-inflammatory and anti-inflammatory) in this population.

Methods

Subjects with traumatic SCI enrolled in the Rehabilitation Engineering Research Center on SCI were followed from acute care through inpatient rehabilitation. Plasma and urine samples were collected three times a week in acute care, weekly in inpatient rehabilitation and periodically after discharge using a Luminex™ 100 IS. These biofluids were subjected to analysis of cytokine expression (IL-1β, IL-1ra, IL-2, IL-2R, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12p40, IL-13, IL-15, IL-17, TNF, IFN-α, IFN-γ, GM-CSF, MIP-1α, MIP-1β, IP-10, MIG, Eotaxin, RANTES, and MCP-1) using the Luminex™ platform (MiraiBio-Hitachi, South San Francisco, CA) and the human 25-plex Luminex™ beadset (BioSource-Invitrogen, Carlsbad, CA). Active and latent TGF-β1 and -β2 were assayed using cytokine-specific ELISA kits (R&D Systems, Minneapolis, MN).

The occurrence of pneumonia and incidence of a first pressure ulcer incidence were studied retrospectively. For analysis, subjects were grouped according to sequence and timing of presence of pneumonia and pressure ulcer incidence into four groups: (1) pneumonia and no pressure ulcer within three weeks, (2) pressure ulcer and no pneumonia preceding the ulcer, (3) pneumonia coinciding with or preceding the ulcer within three weeks, and (4) no pressure ulcer and no pneumonia. The frequency in each group was calculated and a chi-square test was performed. A three week period was chosen because it represents the typical time needed for resolution of the pneumonia (Marrie, 1994). Results: Data analyses were performed for 86 subjects, 70 male, with a mean age of 40 ± 2 years. The mean days to onset of pneumonia was 11.2±1.9 days post injury. Mean days to formation of first pressure ulcer in this population was 20.4±2.2 days post injury. The frequencies observed were 20, 16, 15 and 35 for groups one through four, respectively. The Chi-square test produced $\chi 2$ (1, n=91) =5.664, p=.017. Simple scatter plots of cytokines interlukin-1beta (IL1-β) and tumor necrosis factor-alpha (TNF-α) those who had pneumonia and pressure ulcer occurrence showed a gradual increase in these pro-inflammatory cytokines from day of injury until 50 days after injury.

Pro-inflammatory cytokines such as interlukin-1beta, interlukin-6, interlukin 10, tumor necrosis factor-alpha and anti-inflammatory cytokines such as interlukin-10 were compared at specific time points to explore differences between the four groups.

Conclusion

The results indicate that a higher proportion of pressure ulcers occur in individuals with SCI with pneumonia. Thus, surveillance and prevention measures for pressure ulcers should be even more rigorous in those individuals.

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PS2.3: Relative effect of pressure, temperature, shear on non-damaging tissue ischemia

Yi-Ting Tzen, PhD
David M. Brienza, PhD
Patricia E. Karg

Introduction

Tissue ischemia is one of the main pathways of pressure ulcer formation, and the external risk factors include prolonged pressure, shear force and increased skin temperature. The relative effect of these three factors in combination on tissue ischemia has not been fully explored. The purpose of this study was to evaluate the relative contribution of the three factors on the effect of tissue ischemia by measuring the reactive hyperemic response. Reactive hyperemia is a normal physiological response characterized by sudden increase in blood flow after release of tissue ischemia. This response has been used in previous pressure ulcer studies to quantify the effect of tissue ischemia.

Methods

This study used a repeated measures design. Four adults (40-65 years old) without any cardiovascular disease were recruited. They were non-smokers and did not have hypertension or diabetes. The experiments were performed at the sacrum of the participants, who were lying in a prone position. The reactive hyperemic response was recorded following 21 combinations of three factors: pressure of 0, 8.0, and 13.3 kPa (0, 60, and 100 mmHg, respectively); shear stress of 0, 6.7, and 14 kPa; and temperature of 28, 32, and 36°C. Each of the 21 combinations were tested twice. Therefore, a total of 42 tests were conducted on each participant. Each test took 30 minutes to complete, comprising a 5-minute measure of baseline blood flow under no pressure/shear/temperature control, followed by a 15 minute measure during application of one of the 21 combinations of pressure/shear/temperature, and then a 10 minute measure of the reactive hyperemic response under no pressure/shear/temperature control. A computer-controlled indenter was used to control the pressure and temperature on the skin, while a pulley system attached to the base of the indenter induced shear stress in one direction. A laser Doppler flowmetry probe was located at the center of the indenter to measure skin blood flow continuously. Two parameters were identified to quantify the reactive hyperemic response, including the normalized peak blood flow (peak blood flow normalized to the baseline blood flow), and perfusion area (the area between the curve of hyperemic response and baseline blood flow). linear rank regression models were developed to predict reactive hyperemia with pressure, shear, and temperature as the independent variables. The coefficient ratio of the predictors was calculated for relative contribution of each predictor to outcomes.

Results

Regression models showed that pressure and temperature were significant predictors of the normalized peak and perfusion area of reactive hyperemia ($p<0.001$ for both). However the contribution of shear force was insignificant ($p>0.05$). Furthermore, R2 of the regression model increased from 0.222 with pressure as the only predictor to 0.348 with pressure and skin temperature as predictors for the normalized peak blood flow; and R2 of the regression model increased from 0.243 with pressure as the only predictor to 0.419 with pressure and skin temperature as predictors for the perfusion area. The coefficient of pressure in the regression model was 0.654, and temperature was 5.051 for normalized peak blood flow; while the coefficient of pressure was 0.683, and temperature was 5.969 for perfusion area.

Discussion

Results from this study showed that when skin temperature was added to the equation, the R2 for the regression models increased approximately 60-70% from using only pressure in the equation. This indicates that the effect of ischemia in the skin can be estimated with significantly greater accuracy if one takes into account both pressure and skin temperature, than by reliance upon pressure alone. The coefficient ratio of pressure and skin temperature from the regression model suggested that a one degree Celsius increase in skin temperature contributes as much to the reactive hyperemic response as 7.72-8.74 mmHg of interface pressure.

Conclusion

Findings of our study highlight the importance of managing both interface pressure and skin temperature to limit the occurrence of pressure ulcers. We found that one degree Celsius increase of skin temperature contributes 7-8 times as much to tissue ischemia as one mmHg increase of interface pressure. Since tissue near bony prominences deforms naturally during weight bearing, actively lowering the temperature may reduce the damaging effects of ischemia and lower the risk of developing a pressure ulcer. Microclimate control of the skin could be considered by clinicians to prevent ulceration caused by prolonged ischemia. In addition, manufacture of support surfaces with microclimate control could be beneficial in protecting skin tissue against ischemia.

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PS2.4: Spinal Cord Injury and Interface Pressure: Using functional activity in pressure relief

Rachel M.Schofield, OT, BSc, Hons

Learning Objectives

1. Describe the types of pressure relieving movements used by individuals with a spinal cord injury
2. Describe the effectiveness of performing pressure relieving movements
3. Critically reflect on which pressure relieving movement is best for their population and on how to encourage concordance with such methods

Background

Pressure ulcers are one of the most common secondary complications of spinal cord injury (SCI) (Kroll et al., 2007), often attributed to spending prolonged periods of time in the seated position combined with reduced mobility and sensation (Feuchtinger et al 2005, Thorfinn et al 2002). When sitting, approximately 50% of body weight is concentrated over just 8% of body surface area, causing high interface pressure (Staas & Cioschi, 1991) , consequently ischial tuberosity and sacral region are at most risk of ulceration (Garber & Rintala, 2003;Tam et al., 2003).

One of the most effective preventative methods in terms of cost and pressure relief is regular repositioning (Sprigle & Sonenblum, 2011). Within rehabilitation, individuals with SCI are taught to perform regular repositioning movements, such as forward leans and push ups in order to redistribute the build-up of pressure around the ischial tuberosity and sacral regions. Although performance of pressure relieving movements is recommended as often as every 15 minutes (NPUAP, 2007), research has shown that concordance with regular repositioning is poor (Stockton & Parker, 2002 ; Yang et al., 2009).

It was hypothesised that integrating weight shifts within everyday activities would enhance concordance and thus promote tissue viability. Computer use is a popular activity amongst individuals with SCI (Goodman et al., 2008), used for both leisure and employment (Alexander & Currie, 2004). As computer use is thought to habitually restrict seated movement encouraging sedentary behaviour, the aim of this clinically based cohort study was (1) to investigate the current pressure relieving behaviours of SCI individuals during everyday computer use, and (2), to investigate the application of an ergonomically adapted computer- based activity to enhance tissue viability.

Methods

A convenience sample of 14 subjects diagnosed with SCI (12 male, 2 female; age range 23- 62 years) was recruited to participate in this study. Recruitment and data collection took place in the Regional Spinal Cord Injury Unit, Musgrave Park Hospital, Belfast Health and Social Care Trust. Ethical approval was obtained from the Office of Research Ethics Committees Northern Ireland.

This exploratory pilot study comprised two strands (A and B) followed by a questionnaire. Strand A used a prospective, cohort design and Strand B used a repeated measures design. Throughout both Strands A and B of the study, participants sat in their own wheelchair on their prescribed pressure relieving cushion, and wore loose fitting clothing, e.g. tracksuit bottoms. The Xsensor pressure sensing mat was placed between the participant and the wheelchair cushion surface. An Activpal3 accelerometer was attached to the participant's sternum (Tefler et al., 2009) using the hydrogel PalStickies (Paltechnologies).

Strand A involved participants engaging in a computer activity of their choice, for a one hour period whilst the frequency and type of movements performed were recorded. Strand B involved participants performing a computer based activity wherein their position was alternated between normal sitting (10 minutes) and forward reaching (5 minutes) over a 30 minute period. In order to illicit a standardised forward reaching position, the computer keyboard or IPAD was moved away from the participant to a position 150% x arm length (measured from acromion process to 2nd meta-carpel phalangeal joint). All participants completed both strands in the same order; strand A followed by strand B and finally, the questionnaire. This ensured the study procedure was standardised for all participants and reduced the risk of participant's normal sitting behaviours being influenced by the weight shift activity during strand B or the questionnaire.

Main Outcome Measures

Interface pressure measurements, including dispersion index (DI), peak pressure index (PPI) and total contact area (CA) were recorded using an Xsensor pressure mapping system. The angle of trunk tilt was measured using an ActivPAL3 accelerometer, and the participants' views of performing repositioning movements, current computer usage and ease of performing the adapted activity were obtained using a short questionnaire.

Results

Strand A:
Observational analysis and results of pressure mapping data revealed that no participants adhered to national recommendations of performing pressure relieving movements every 15 minutes (NPUAP, 2007). However, 42.86% of participants did perform at least 4 movements during the 1 hour period. The majority (84.4%) of all movements performed were categorised as yielding less than 25% reduction in interface pressures when compared to normal sitting. Thus, the effectiveness of the majority of weight shifts performed in terms of pressure relief was low.

Strand B:
Analysis of pressure mapping data and trunk accelerometer data revealed that activity that encouraged reaching forward by 150% of arm length significantly reduced interface pressures around the ischial region compared to 'normal' sitting ($p<0.05$). A one way repeated measures ANOVA revealed that reaching forward by 150% of arm length during an adapted computer activity significantly reduced DI ($p<0.05$) and angle of trunk tilt ($p<0.05$) compared to normal sitting. However, compared to normal sitting, reaching forward by 150% did not significantly affect CA.
A Friedman Test showed that reaching forward by 150% of arm length significantly reduced PPI for both the right and left ischial tuberosity regions compared to normal sitting ($p<0.001$). However, a simple regression model revealed weak correlations between angles of trunk tilt and interface pressures. The angle of trunk tilt during an activity was not a reliable indicator of weight shift activity or of pressure unloading.

Questionnaire:
The majority of participants (N=12) reported that they used a combination of traditional repositioning methods of various frequencies.
Seven participants (54%) found reaching forward by 150% during the computer activity to have been an achievable task to perform, rating the task as very easy (n= 1), easy (n=4) or slightly difficult (n = 2). In contrast, three of the participants (23%) found it 'difficult' and a further three participants were unable to complete Strand B as their trunk stability would not sustain the forward reaching activity. Despite this, the majority of participants (n=10; 77%) considered that incorporating pressure reliefs within an activity would make them easier to perform when compared to traditional pressure reliefs.

Conclusion

This study investigated the current pressure relieving behaviours of SCI individuals during everyday computer use, and explored the application of an ergonomically adapted computer- based activity to enhance tissue viability.
The first aim of this study was to investigate the current pressure relieving behaviours of SCI individuals during everyday computer use. During a 1 hour computer activity, no participants adhered to national recommendations of performing pressure relieving movements as frequently or persistently as every 15 minutes (NPUAP, 2007). It is of note that the majority of movements performed were held for less than 20 seconds, which is highly unlikely to be beneficial in terms of tissue reperfusion (Makhsous et al., 2007). Furthermore, results from the questionnaire revealed that participants' perceptions were that they performed many pressure relieving movements throughout their average day. However, considering the low pressure relieving value of the movements performed under observation, it would seem reasonable to question the worth of currently recommended movements as a preventative strategy for ulceration. Thus, further work is needed to investigate other methods of improving performance and concordance with repositioning methods among at risk populations.
The second aim of this study was to investigate the application of an ergonomically adapted computer- based activity to enhance tissue viability. Strand B of this study found that incorporating a 150% forward reach into a computer activity significantly decreased interface pressure at the ischial region. It should be noted, however, that three of the fourteen participants could not complete strand B of the study due to poor trunk stability. A further three participants found the task to be either 'difficult' or 'very difficult'. Despite this, responses from the majority who completed the questionnaire welcomed the idea of integrating weight shifts within a daily activity, and believed that this would make pressure relieving movements easier to perform.

Redistributing high interface pressure from the bony ischial tuberosity region to another area is important for reducing the risk of developing pressure ulcers during sitting.
Health practitioners should explore how pressure relieving movements, such as leaning/ reaching forward, could be incorporated into everyday daily activities, depending on functional ability, in an effort to improve client concordance with national pressure relieving recommendations (NPUAP, 2007).

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IC17: The Wheelchair Skills Program and the WHO Guidelines on Wheelchair Provision

R. Lee Kirby MD, FRCPC

Learning Objectives

Upon completing this course, attendees will be able to describe:

1. The eight steps in the WHO wheelchair-provision process and how the WST and WSTP relate to it.
2. When and how wheelchair skills should be assessed.
3. How wheelchair skills can be most effectively taught.

Abstract

The World Health Organization (WHO) Guidelines on the Provision of Wheelchairs are increasingly being recognized as the standard of care, both in highly developed and less-resourced parts of the world. Of the eight steps in the WHO wheelchair-provision process, wheelchair skills are particularly relevant for two of them. During the assessment step, in addition to the usual evaluation of the client and his/her context, there should be an evaluation of wheelchair-skills capacity and performance. The Wheelchair Skills Test, available as either an Learning Objective (WST) or questionnaire (WST-Q) version, is a well-validated assessment tool that can be used for such an assessment. During the training step, in addition to training about wheelchair features, repairs and maintenance, there should be training of the wheelchair user and caregiver about how to best perform relevant wheelchair skills. The Wheelchair Skills Training Program (WSTP) is a low-tech high-impact intervention that combines the best available evidence about how to perform specific skills with the best evidence on how to teach motor skills. Research evidence has been accumulating that demonstrates the safety and superior effectiveness of such a formal approach to wheelchair skills training. All WST and WSTP materials are available free on the Internet. This session will provide an overview of the WHO Guidelines and provide a practical approach to the assessment and training of wheelchair skills.

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Wheelchair Skills Test 4.1 (Objective Version)
Manual Wheelchair - Wheelchair User
Name: ______________________________
Date: ___________ Tester: ______________
Time start: _______ Time finish: _________

Scoring Guide
✔ = pass, safe
✖ = fail, unsafe
NP = no part (only for indicated skills)
TE = testing error

	Individual Skills	Capacity	Comments
1.	Rolls forward 10m		
2.	Rolls forward 10m in 30s		
3.	Rolls backward 5m		
4.	Turns 90° while moving forward		
5.	Turns 90° while moving backward		
6.	Turns 180°in place		
7.	Maneuvers sideways		
8.	Gets through hinged door in both directions		
9.	Reaches 1.5m high object		
10.	Picks object from floor		
11.	Relieves weight from buttocks		
12.	Transfers from WC to bench and back		
13.	Folds and unfolds wheelchair		No Part?
14.	Rolls 100m		
15.	Avoids moving obstacles		
16.	Ascends 5° incline		
17.	Descends 5° incline		
18.	Ascends 10° incline		
19.	Descends 10° incline		
20.	Rolls 2m across 5° side-slope		
21.	Rolls 2m on soft surface		
22.	Gets over 15cm pot-hole		
23.	Gets over 2cm threshold		
24.	Ascends 5cm level change		
25.	Descends 5cm level change		
26.	Ascends 15cm curb		
27.	Descends 15cm curb		
28.	Performs 30s stationary wheelie		
29.	Turns 180° in place in wheelie position		
30.	Gets from ground into wheelchair		
31.	Ascends stairs		
32.	Descends stairs		
	Total Percentage Score		= # passed skills/ (32 - # NP - #TE) X 100%

- See the WST 4.1 Manual for details (http://www.wheelchairskillsprogram.ca/eng/testers.php).

Additional comments:
____

IC18: Evidence-Based Guidelines for IPM: Final Research Findings

Kimberly A. Davis, MSPT, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. State the recommended minimum calibration frequency.
2. List two different acceptable settling time ranges.
3. List two different acceptable methods of infection control for IPM.

Lack of a consistent data collection procedure and interpretation protocol across seating clinics internationally was the driving force behind this two-year research project, which focused on three popular IPM systems: FSA, Tekscan Conformat and XSensor. With progression of this project from its starting point of laboratory bench testing to the human subject testing phase, it became increasingly more evident that controlling what we can during the data collection procedure lends to a more rigorous interpretation protocol. This presentation will offer clinically translatable guidance on specific IPM usage components including calibration, settling time, reproducibility of metrics across cushion types and mat types, isolation bag effect, and comparison of infection control practices.

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IC19: Integrating Outcome Assessments into Practice: The Functional Mobility Assessment

Elaina Halkiotis MOT, OTR/L, ATP
Jean Minkel, PT, ATP

What is the FMA

The Functional Mobility Assessment (FMA) was created by Dr. Mark R. Schmeler and his colleagues at the University of Pittsburg. Dr. Schmeler describes the tool as follows: "The Functional Mobility Assessment (FMA) instrument is a self-report outcome tool, designed to measure the effectiveness of Wheeled Mobility and Seating (WMS) interventions for people with disabilities (PWD)." The FMA was based off of the Functioning Everyday with a Wheelchair (FEW) assessment. Unlike the FEW, the FMA captures data from users of ambulatory devices and those who were not using any assistive device prior to intervention. The FMA is administered as a pre-test and a post-test to seating intervention, to Learning Objectively documenting outcomes from the provision of seating and mobility technologies.

At Independence Care System (ICS), as part of our Wheelchair Clinic practice, the pre-test and post-test FMA is administered. Users rate their level of satisfaction with their current Mobility Assistive Equipment (MAE) for ten items on a six-point Likert Scale at pre-test and post-test. At pre-test, the user also prioritizes the ten items according to what they personally consider most important from 10, their highest priority, to 1, their lowest priority.

FMA Items

1) Carrying out my daily routine
2) Comfort needs
3) Health needs
4) Operation
5) Reaching and carrying out tasks at different surface heights
6) Transfers from one surface to another
7) Personal care tasks
8) Indoor mobility
9) Outdoor mobility
10) Personal and public transportation

Rating Scale

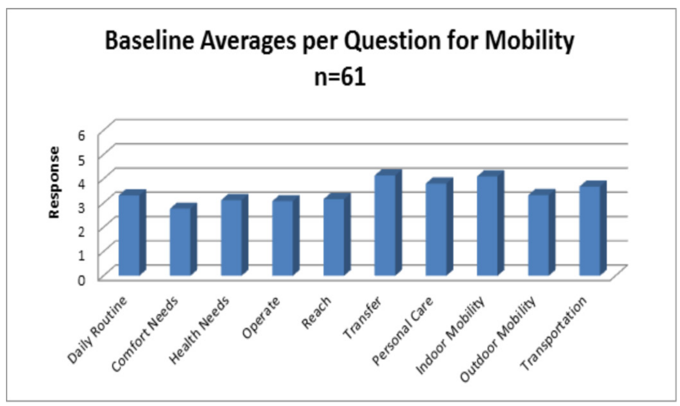
6) Completely Agree
5) Mostly Agree
4) Slightly Agree
3) Slightly Disagree
2) Mostly Disagree
1) Completely Disagree
0) Does Not Apply to Me

FMA Administration

The FMA pre-test is administered at initial evaluation, prior to new mobility product demonstration and specifications. The FMA is used in conjunction with the seating clinic's evaluation and mat assessment to establish the user's goals for the new seating system. The FMA post-test is administered approximately one month after new MAE delivery. The FMA can be administered over the phone or in-person. Administration takes approximately 10 minutes but can take longer based on the user's communication skills and style.

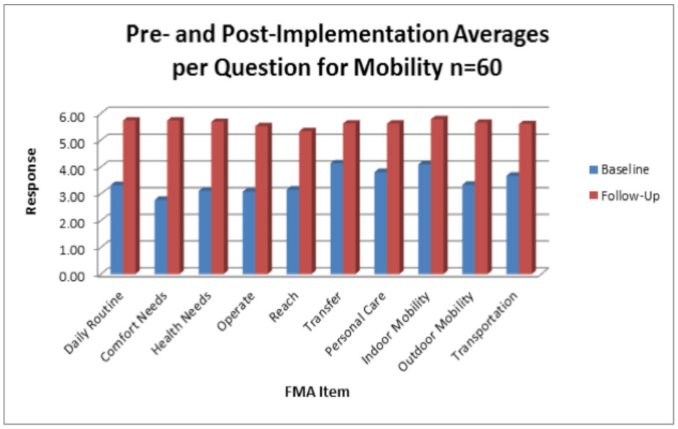
What is Independence Care System?
Independence Care System (ICS) is a not-for-profit Medicaid Managed Long Term Care (MLTC) program for adults with disabilities in New York City. The mission statement of ICS is as follows: "Independence Care System is dedicated to supporting adults with physical disabilities and chronic conditions to live at home and participate fully in community life." The ICS Rehabilitation Department has four Assistive Technology Practitioners, three Wheelchair Repair Technicians and three Rehab service coordinators. ICS serves over 3000 members in our wheelchair clinics and through home visits. ICS provides evaluations, training, delivery, fitting and set-up of wheelchairs, scooters, ambulatory devices, and bathroom equipment.

The ICS Wheelchair Clinic has integrated the collection of pre and post data into our intake interview process. Below is our pre-test data through September, 2012.



Our pre-test data illustrate that the domains of Daily Routine, Health Needs, Ease of Operating and Outdoor Mobility are all in the "unsatisfactory" range, with scores from 1-3 out of 6 points. The consumer's lowest level of satisfaction with their current mobility device is in the Comfort Needs domain.

Comparison Data



Comparison of pre and post data illustrates that user satisfaction with the new MAE increased in every area assessed. Greatest satisfaction was reported in daily routine completion, comfort needs, and indoor mobility. Several users identified difficulty reaching items on the floor or overhead when using their new MAE. This was remedied through further training and sometimes by issuing a reacher.

How FMA Outcome Measures Have Guided Practice: Pre-Test

We have used the findings from the FMA pre-test to prepare appropriate MAE demonstration devices and to guide the specifications process. We have found that administering the FMA pre-test has shown users that the therapist and supplier are eager to hear about their wants and needs for a new MAE and are committed to implementing them as much as possible in their seating interventions.

How FMA Outcome Measures Have Guided Practice: Post-Test Information:

The FMA outcome measures obtained after administration of the post-test have been shown to identify whether or not the goals for intervention have been met, trends among user groups, additional needs for the specific user and additional needs for groups of users. If the original goals for intervention have not been met, probing questions are used to identify how those goals can be achieved. Sometimes this requires follow-up in-clinic or home visit appointments for further MAE training, modification of the device for comfort and/or function, or referral to an outside program to learn new skills.

A common finding in our clinic was that new scooter users who were previously ambulatory with a cane or walker, rated FMA item 6, Transportation, higher at the post-test than at the pre-test. This was often because those users were able to use a taxi or personal vehicle for transportation when using their ambulatory device but could not do so with a scooter. We have now established a system of referring refer those users to an outside travel training program to learn how to access public busses, subways, and trains with their new MAE. Further information about the Metropolitan Transit Authority Travel Training Program can be found by contacting Pier Fetz at pfetz-scimeca@cpofnys.org.

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IC20: More-Is-More? Aligning Expectations for 21st Century Rehabilitation

Laura Wehrli, PT, DPT, ATP

Learning Objectives

1. Identify strategies to align expectations between patients and therapists during post-SCI rehabilitation
2. Discuss 3 types of evidence-based rehabilitation technology
3. Identify 2 references for each recovery-based intervention: Functional electric stimulation (FES), Locomotor Training (LT), and Whole Body Vibration (WBV).

Is there a need to align expectations?

- Harvey, et al 2012, "Effective therapy following spinal cord injury (SCI) relies on a working partnership between patients and physiotherapists …It is therefore potentially problematic … if patients and physiotherapists have markedly different expectations …about the likely outcomes for the fundamental motor skill of walking. ….For example, if patients expect to walk, they may be unwilling to learn wheelchair and transfer skills…"
- "When are we going to work on my legs? I want to walk."

Motivational Interviewing (MI) – Dr. Charles Bombardier, PhD, ABPP; University of Washington/Harborview Hospital

- … collaborative, person-centered form of guiding to elicit and strengthen motivation for change.
- Respectful conversation focused on building rapport and instituting self-directed change
- Use open-ended questions/statements to start conversation
- Withhold judgment or confrontation
- Really listen to the patients goals and reflect them back in conversation
- Allow patients to interpret, problem-solve and make decisions regarding their situation
- Put the patient in control

**Familiarize yourself with current evidence and maximize "activity-based" therapies in their program as your facility/ resources allow

Activity/Recovery-based Therapy

"The goal of this approach is to achieve activation of the neurological levels located both above and below the injury level using rehabilitation therapies in order to facilitate recovery after a debilitating neurological incident." [Sadowsky 2009]

- Functional Electric Stimulation (FES)
- Locomotor Training (LT)
- Whole Body Vibration

Suggested Reading and Reference List

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IC21: Improving Patient Outcome: A Service Delivery Model Approach

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Introduction

In today's rehab world, therapists and vendors are challenged to provide a quality service to our patients in a manner that establishes professionalism and credibility to our third party payers. Our industry is bouncing back from the black eye created by companies that center their business around mass marketing and a business plan to exploit group 2 products. This course will explore how the Ohio State University Seating Clinic is trying to improve our customer experience and build credibility through our service delivery system for rehab products. This course will explore case studies that establish a need for collaboration from evaluation, trial of equipment, final fittings, and post implementation follow up. We will have several comparative references for how this approach vs. previous model, that focused on team collaboration that only focused on front end evaluation of the client, has resulted in improved outcomes. This course will also review the roles of the supplier and therapist in each of these steps. We would like to share the platform of this team approach and what we see as the benefit to overall patient care. We would also like to explore how this process maintains advantages not only for the client, but also for the clinician, the clinic, and the vendor in dispensing rehab equipment.

The Ohio State University Seating Clinic

The Ohio State University seating clinic is a multidisciplinary clinic that involves the vendor, an occupational or physical therapist, and the services of a Rehab Engineer. The clinic accepts appointments for new chair evaluations, wheelchair modification evaluations, pressure mappings, and follow up appointments for problem solving and for final fitting of the client's equipment. The clinic manages a variety of requests for mobility, but for this presentation we will focus on the evaluation process, the education and trial phase, and the final fitting/implementation of equipment. The primary goal for our clinic is to provide an ongoing resource for clients that have wheeled mobility needs.

The Evaluation Process

The therapist (Occupational or Physical) and Vendor are present for initial evaluations. The therapist initiates the evaluation in search of 3 types of evidence: observation, user feedback and quantitative. Therapist will use this session to dig for subjective functional information, when the client is on the bubble of getting items approved. Vendor and therapist are present to collaborate on funding versus medical needs. Discussion supports the client needs over the next 5-7 years. Goal is to formulate a plan for funding and implement the documents needed to get the equipment funded through insurance. This plan may be modified to some degree after scheduled follow up for trial/education. Clinician also has access to online documentation of any MD associated with large university health care system (Opportunity to dig for necessary information to support chart note or needed diagnosis). Previous models included conclusion of the medical component with the vendor to still determine how to make the equipment specs work within the medical framework/specifications provided. Previously decisions were made pre-maturely with client satisfaction compromised on the back end of the process. The newer model provides improvement in that team can address the product limitations (i.e. seat to floor heights, wheel size, feature options on each specific base, etc.) while still together as a team. If more time is needed then a follow up session is scheduled for education/trial of equipment.

The Education and Trial

Following time limitations of initial evaluation, client may be scheduled for a follow up to support further education. Therapist will often utilize Learning Objective measures to support documentation and educate client on best match for equipment. Learning Objective measures commonly utilized in our clinic: pictures of severity of postural deformity and assist of corrective/adaptive seating, pulse oximetry, timed balance and walking tests: TUG, 30 m walk, Tinetti; pressure mapping, Smart Wheel, wheelchair skills test from Kirby-baseline data. Our plan is to provide some case study documentation on how this process has led to an always evolving approach to how we treat our clients. We will offer several examples on how this phase has improved our process through providing that important trial of wheelchair components (i.e. ultra lightweight with solid backrest). We will also discuss how the therapist has learned to trust first instincts on client goals versus what is clinically needed in a situation. (MS client scooter versus power wheelchair). Also, through trial and error we have identified several key measurements that have led to better outcomes with our ultra lightweight deliveries. Wheelchair specifications are confirmed on this date and any additional assessment is completed (custom molding, demo of alternative drive controls, demo of transfer strategies from a variety of ultra lightweight frames, car transfers, etc.)

The Final Fitting

The final fitting phase has become an important way to share in the wins and losses of each wheelchair implementation. Final fitting has become a crucial component on clinical growth of the therapist and the wheelchair vendor. It has also provided better final outcomes for the client and time saving options for the wheelchair vendor. As our clinic has grown, we have discovered the value of implementing the final shape fitting for our custom molds. These high end evaluations benefit from a multi-disciplinary approach to the fitting. Having several capable hands available allows us to address the sometimes complex fitting needs (i.e. programming, fitting of custom seating, wheelchair adjustments, training, pressure mapping, etc.)The final fitting phase also is a great platform for use of Smart wheel, Kirby manual and wheelchair skills test, transfer ability, pressure relief strategy and education, skin monitoring, weaning schedule for custom seating. With complex cases or when further training is required, a 1 month follow up reassessment is scheduled at this time. This follow up time allows us to determine if the equipment is improving the quality of our client's life over an extended period of time.

Summary

The content of this presentation will focus on how the Ohio State University is approaching the process for wheelchair/mobility implementation. Out the door are old school approaches of the therapist providing the front end paperwork and then handing the order to the mobility vendor to complete the process. Our industry's need for increased credibility and improved client outcomes screams for more clients getting their equipment through this team based approach. Providing this platform illustrates how the client, clinician and the vendor benefit from this team based approach. We feel a small list of positives from this approach include: the new process is a time saver in high end chairs, The therapist can provide a middle ground for the evaluation and delivery, multiple heads and expertise provide greater outcomes, follow up clinic provides increased time on front end to decrease time demands on the back end, and finally this process has lead to more referrals for alternate DME items and assistive technology needs. Ultimately this process has lead to a more comprehensive resolution to the client's mobility and ADL needs.

IC22: The Relationship Between Vision, Posture and Mobility

Teresa Plummer, PhD, MSOT, OTR, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Define the primary visual structures and discuss their relationship to visual processing.
2. Identify and discuss the relationship of visual function and human posture.
3. Define at least three seating strategies to influence a client's visual/postural function in a wheeled mobility device.

This instructional course will present an overview on the relationship of the visual system on posture and mobility. While the concepts presented are specific to the pediatric population, the principles presented can be applied to the adult neurological population.

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IC23: Why We Do the Things We Do? Transfer of Learning to Clinical Practice

Patricia E. Tully, OTR, ATP
Lois Brown, MPT, ATP/SMS

Learning Objectives

1. Identify the specific type of training that enhances knowledge acquisition verses what type of learning promotes skill mastery?
2. State at least three program elements that are critical to supporting a learning environment.
3. Name at least two methods by which therapists develop clinical decision making with regard to selecting equipment parameters that match the client's needs.

Therapists find themselves in the midst of a transition from the student role to the professional adult learner's role as they enter the profession, they also find themselves in transition from general knowledge to specializing in certain treatment areas, or transitioning from one specialty to another through out their careers. Therapy programs educate their graduates as generalists with a broad exposure to the delivery models and systems used in settings where therapists will practice. As a novice therapist the focus has shifted from the classroom environment focused on the needs of the student, to the clinic setting surrounding the needs of the patient. Wheelchair seating and mobility requires an expert to manage the complexity of this service and delivery systems. How do adult learners manage this shift as they move from being a generalist into development and mastery of their professional skills, such as the complex requirements of wheelchair seating and mobility?

What guides therapists -as part of the service delivery team- in clinical decision making with respect to wheeled seating and mobility? Therapists must be educated, trained, and mentored before they can successfully participate in such complex skills. Mentorship's complexity requires a great deal of consideration and investment in the midst of our changing healthcare environment. Systematic barriers are likely to impact the ability to provide this degree of mentorship for therapists outside of the normal treatment sessions. The complexity of wheeled seating and mobility service delivery coupled with the multifaceted cognitive process therapists must employ during clinical decision making and treatment planning should be considered. Looking at the service delivery team may help distinguish strengths and weaknesses in the decision making process.

Payment sources and the community at large are asking more and more for evidenced base treatment. How can we instill open minded consideration of not only the research but other seating perspectives that could positively impact prescription? Is evidence based practice the deciding factor or are their other factors such as the functional evaluation that should be involved with clinical decision making for patient needs?

What governing bodies oversee the current clinical guidelines, research and evidence we rely on? How does this influence our decisions? The vast array of governing bodies who oversee the current clinical education accreditation also may contribute to the inconsistencies and variance in learning. Research and evidence are an important part of this process, however, emphasis at times is being mis-placed on how research is chosen and presented. This may affect the focus of what is being conveyed to the audience as they seek to understand "evidenced based practice", and how it should be interpreted and applied to clinical practice.

This presentation will explore what learning and teaching methods are being used to train those therapists becoming involved in this intervention. While the AOTA and APTA recently passed new accreditation standards to formally include and teach wheeled seating and mobility education in Occupational Therapy and Physical Therapy Programs, post-graduate clinicians face a plethora of learning opportunities with varying teaching methods, but are we teaching to skill or knowledge, capability or competency? Are we using recognized taxonomy which defines how well a skill or competency is learned or mastered?

Part of the challenge is not only the variability of those providing the education but also different paradigms used in doing so. The learning opportunities are great and are offered by a variety of sources with varying perspectives and Learning Objectives. These range from web based learning, online and recorded sessions, live face-to-face training, to "hands-on" courses. Education is designed from one hour course on a specific topic, to more formalized training programs, but again it is unclear if there is a well-defined hierarchy of learning/knowledge transfer occurring in the process. Another example of teaching utilizes the "case study" approach which attempts to "teach by example" which 1) may or may not be based on evidence and 2) provides only one construct which also may not provide "transferable" knowledge to the clinician. Our approach on how we train new and existing clinicians varies based on how and what information is presented.

Often the learning feedback loop is not complete. When the student is unable to "follow" the patients progress/outcome and learn about the impact of their decisions, the learner (clinician) does not have the opportunity to process and evaluate how their interventions impacted the user and their needs; what kind of impact their decision had on the patient outcome; if it had a positive impact ; and are not able to reflect on the clinical decision making or learning process. How is the service delivery model designed to retain and support the continued learning of the more experienced therapist? This presentation will explore and present survey results which are aimed at helping us to evaluate and design new teaching methods and programs for staff education which will hopefully enhance the learning process, explore the research, and present other models of knowledge transfer within other health care environments. It is important for us as a collective group to evaluate our current practice in knowledge transfer to not only improve patient outcomes but to improve the service delivery model to retain and support the continued learning of our novice and advanced clinicians. Without a pathway for continued learning for the novice or advanced clinician, we not only limit their personal growth but also limit the design and implementation of staff training programs.

Data and feedback from therapists will be collected via electronic survey/questionnaire. The results will be shared with the audience and linked to pertinent information found within the literature. The focus of the survey asks questions about education and staff retention in the wheeled seating and mobility roles. Decision making methods will be discussed; and a comparison of service delivery models will shared. Conclusions and recommendations resulting from the feedback can be used to enhance Mobility and Seating Service delivery programs. This information can be utilized to implement staff training as each therapist has responsibility to address mobility and seating equipment interventions.

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IC24: How to Select a Proper Stander for Children with Disabilities

Yunn-Yi Pau-Lee, PT, M.A. ATP

Introduction

This course is appropriate for physical therapists and physical therapy assistants as well as for durable medical suppliers who are responsible for fitting children with disabilities with a proper stander. Children with physical disabilities frequently utilize standing devices at school as well as at home to assist in weight bearing on the lower extremities, providing an alternate position, and for post-operation management. Clinicians are often responsible for determining the most optimal stander for clients. It is critical for therapists to know what expectations are from using the stander so that they can make the most educated recommendation to the family based on the child's specific needs.

Medical Benefits of Standing has been well documented. However, funding sources sometimes like to use "lack of evidence" as the primary rational to deny our requests. I have included a list of a few wonderful websites that provide excellent references and outlines of the Medical Benefits of Standing. For more detailed information, please go to the reference websites. I encourage you to visit these websites frequently since they are updating their articles continuously. In summary, the most widely accepted **Medical Benefits of Standing** include:

1. Prevention of contractures (ankles, knees, and hips)
2. Improvement of range of motion (spine, hips, knees and ankles)
3. Reduction in spasticity
4. Prevention or reversal of osteoporosis and resultant hypercalciuria
5. Improvement of renal function, drainage of the urinary tract, and reduction in urinary calculi
6. Prevention of pressure ulcers through changing positions
7. Improvement in circulation as it related to orthostatic hypotension
8. Improvement in bowel function
9. Facilitation of a natural symmetrical standing posture
10. Development & improvement of upper body balance & strength
11. Alleviation of pain caused by prolonged or inappropriate position
12. Development of standing tolerance & endurance
13. Lessening progressive scoliosis
14. Assisting with skeletal development (in children)
15. Normalization of respiratory function
16. Improve Hip Integrity
17. Develop or improve motor skills
18. Maintain or re-gain bone density
19. Psychological Benefits of Standing
20. Financial benefits

The detailed psychological and financial benefits of standing are as follows:

Psychological Benefits of Standing

1. provide play opportunities to stimulate cognition
2. Increase independence thus developing improved self-image
3. Being active and mobile while standing which promoting increased activities
4. Increase alertness and attention
5. Increase cognition
6. Enhance social development thus increase interactions with peers
7. Participate in activities that are meant to do standing up
8. Increase activities of daily living
9. Be more vocal & responsive
10. Look peers in the eye
11. Give & get hugs easier
12. Encourage inclusion in school
13. Decrease fatigue from inactivity
14. Help prevent depression

Financial Benefits of Standing

1. Reduces required medication
2. Decrease the length of hospitalization
3. Decrease the need for assistance from others
4. Lower the cost for home modification
5. Decrease isolation
6. Promote vocational opportunity thus may decrease the potential of job loss

How do we apply the therapeutic principles when selecting a standing device for children with disabilities?

A. Cerebral Palsy with Diplegia- children with diplegia usually present with fair to good head and trunk control in an upright position as well as functional upper extremities. Standing usually can be achieved with minimal support at the hip joints or by providing a surface for self support. A sit-to-stand stander is commonly used because it can facilitate the dynamic sit-to-stand movement which assists in transitioning the passive standing task to a more dynamic and functional goal. Because most of the models of standing frames work well for children with only the lower extremities involved, the following factors should be put into consideration when making recommendation:

1. **Strengthening Targeted Muscle Group(s)-** Which muscle group(s) need to be strengthened and/or stretched during standing? During treatment session, therapists usually work on some specific muscle groups for the individual. It can be the child's abdominal muscle so that it can counterbalance their super dominant extensor muscle. They may want to focus on the trunk extensors in order to increase their trunk alignment to overcome the gravity. Some therapists may choose to focus on the active contraction of the hip extensors which is needed to maintain the hip in extension position for standing and walking purposes, as well as to overcome the tightness of hip flexors due to prolonged sitting in a wheelchair. For example, children with decreased trunk muscle tone may experience difficulty in exhibiting trunk extension in sitting and standing.

As therapists, we commonly utilize physioballs and bolsters to facilitate active trunk extension combined with upper extremity extension. This goal can be further enhanced by positioning the child in a prone stander in the classroom or at home. This is what we mean when we say: **"adaptive equipment should be considered as part of therapists' treatment plan and be treated as an extension of therapy sessions".** By providing a standing frame with adjustable height, it will allow us to facilitate first the head control by making the standing frame very tall (supporting the entire torso region) and then later progress to the upper thoracic region by lowering the supporting surface to the chest level.

2. **Stretching/ or Preventing Muscle Tightness-** As children develop, their bones grow quickly, and soft tissue (i.e. muscles, tendons, ligaments, vessels and nerves) need to "catch up" to the bone growth. Typically, this happens when children participate in normal play activities (running, jumping, riding bikes). Children with special needs usually do not have the ability to achieve a high enough activity level to stretch their muscles out. From about age six and up, children seem to grow in "chunks," making it even more difficult for a child with special needs to get their muscle growth caught up to their bone growth. The result is a loss of range of motion (ROM) which negatively affects their functional motor skills. A standing device allows children and adults with differing abilities to maintain a symmetrical standing posture for an extended period of time. This extended period of time allows the muscles to elongate and stretch, stimulating the new tissue growth needed to catch up to their bone growth. Children with disabilities who spend a great deal of time seated in their wheelchair can truly benefit from a standing device which allows them to fully extend their hip and knee joints. Another example is for children with tight hamstrings who need to use 90 degree footrest hangers to accommodate their tightness. This setting can interfere with the casters clearance because the footrest hangers are too close to the caster wheels. Using a stander frequently may resolve this issue and get the critical 5 degree of knee extension for better seating alignment.

3. **Preventing Lower Extremity Deformities-** It is possible, but extremely difficult to accommodate windswept posture, leg length discrepancy and different degrees of knee flexion contracture when using a standing frame without individual adjustments to each of the lower extremities. Since our goal is to enhance symmetric posture alignment, it is best to position the children as close to a neutral alignment as possible. For example, children with hip flexor tightness will be best to be positioned in a prone stander with a solid pelvic gait which can effectively prevent hip flexion during standing. Children with significant knee extension contracture will probably benefit most using a sit-to-stand frame because it can accommodate their current limited knee extension but also allow us to change the angle while their joint flexibility improves. There are also some models of standing frames which allow us to position the child in an excessive hip abducted posture post soft tissue lengthening procedures. Surgeon's clearance is absolutely necessary before we put our clients onto a stander after surgery. However, in general, positioning the hips in an abducted alignment can benefit their hip integrity as well as maintain the effectiveness of soft tissue lengthenings.

4. **Equipment can be used for multiple purposes-** With funding so challenging, it is in our clients' best interests if we can recommend adaptive equipment for multiple purposes. It also makes it easier on the storage issue in some families. Just be careful when you go through the order form. Make sure the height of the UESS (tray) can be easily adjusted on both sitting and standing positions.

B. Cerebral Palsy with Spastic Quadriplegia- This group of children also presents with involvement in their bilateral upper extremities, therefore requiring more support in their trunk and/or head. Depending on their physical abilities, various head and trunk support can be added onto a standard stander. The optimal practice model will be to obtain a demo equipment from the manufacturers' representative and try the clients on it. If it is not possible, go conservative. A stander is a stander. As long as our clients can maintain weight bearing on their lower extremities, their safety during transfer on/off the stander should be the primary consideration. User friendly equipment has the most possibility of avoiding equipment abandonment.

C. Cerebral Palsy with Low Muscle Tone- To maintain head and trunk alignment is the most challenging task when standing children with extremely low muscle tone. Supine standers appear to be the safer and most user friendly stander because it requires only one caregiver to position the child onto the stander. It also allows the child to start with partial weight bearing on the lower legs first, then increase the weight bearing when they gain better tolerance. The stander is usually set up high above the ground so that the caregiver does not need to bend over during transfer.

References

Prospect Designs
http:://www.prospectdesigns.com/product-alicia-prone-stander.html

Altimate Medical, Inc
http://www.easystand.com/health-benefits/index.cfm

Rifton
http://www.rifton.com

Levo
http://levousa.com

Yunn-Yi Pau-Lee is not affiliated with any of the mentioned equipment, medical devices or communications organizations.

PS3.1: Consolidated Model of Clinical Seating Services

Marlene Holder, B.Sc., P.T.

The challenges facing healthcare to meet growing demand with tightened budgets requires ongoing evaluation of how services are delivered. This paper examines the method by which the seating clinic at Holland Bloorview Kids Rehabilitation Hospital (Holland Bloorview) evolved its services delivery model. Holland Bloorview Kids Rehabilitation Hospital serves about 7,000 children each year, with approximately 600 inpatient admissions and 58,000 outpatient visits. At the onset of the project, the outpatient seating clinic served 300 clients per year and was staffed by 2 therapists (Occupational or Physical Therapist) for a 1.0 full time equivalent (FTE).

In 2008 the seating clinic at Holland Bloorview started a process improvement project. This was driven by changes in workload which included increases to both wait times and requests for consultation from inpatient therapists and the referring acute care pediatric hospital. This project focused on the premise that quality customer service requires timely service delivery, transparency of processes and strong product quality.

To better understand the initial state of the seating service process and timelines a retrospective chart review of the first 6 months of 2008 was undertaken. The data revealed that the clinic's wait time for assessment was 58 days, far greater than the target of less than 1 month. The timeline review was repeated in 2010 and wait time for assessment had further increased to 72 days. This emphasized that additional measures needed to be taken to address issues including effective staffing, reduced wait times and quality of service. As a result, the project evolved into a series of projects that focused on three areas: redirection of adult clients, inpatient consolidation of seating services and provisioning of seating expertise in the acute care setting.

Adult Redirection

In an attempt to reduce wait times, all the factors impacting the seating clinic were examined. A review of the population identified that one third of the clients seen by the seating clinic were over the age of 18. The practice of continuing to see adult clients with pediatric onset disabilities was originally developed for continuity of care and due to a lack of adult seating services for this population. It was felt that adequate adult services were now available and that this practice was limiting access for pediatric clients that did not have alternate services available.

An external scan confirmed sufficient availability of seating services for adult clients, willingness of these clinics to accept new clients and wait times under 1 month. As a result, a proposal to discontinue adult seating services was submitted to and accepted by senior management. Although adult services were discontinued in 2010, those adults receiving service or on the waitlist for service were permitted to complete their current assessment and intervention. All adult clients seen within the previous 2 years were provided with a package to assist them with choosing an adult seating and were encouraged to contact the Holland Bloorview seating clinic if assistance was required. A bridge appointment was offered and allowed clients to request their seating therapist from Holland Bloorview attend their first appointment.

Inpatient Consolidation

The next initiative focused on examining the process for the provision of seating service across inpatient and outpatient services. Inpatient seating was completed by the client's primary therapist. It was the responsibility of the inpatient therapist to request a loaner wheelchair with seating from an equipment pool, make changes to the equipment as required as well as assess for and prescribe permanent seating and mobility equipment. These responsibilities created challenges at both admission and discharge.

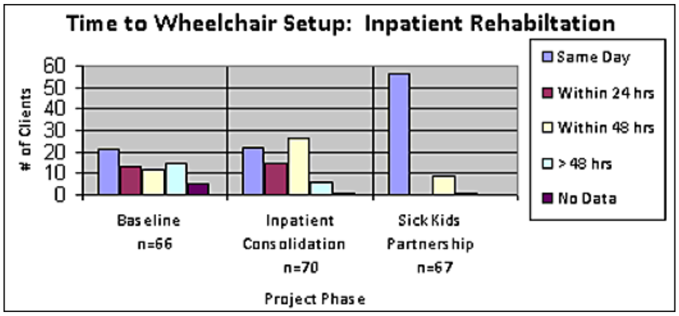
At Holland Bloorview the equipment pool is housed off-site. This allows wheelchairs and seating to be cleaned and serviced following use and enables the wheelchairs to be set up based on the needs of each individual client. While the advantages to a process such as this are clear, it does result in a delay in equipment availability of 24-48 hours. This system's effectiveness is also impacted by the inpatient therapist's ability to assess the client in a timely manner following admission. Ultimately, these delays in wheelchair set up impact a client's ability to fully participate in the rehabilitation program.

Inpatient therapists are unable to provide ongoing service for discharged clients due to workload constraints produced by new client admissions. This resulted in wheelchair and seating prescriptions that are in process being passed to the outpatient seating clinic or community therapist requiring extensive coordination of services. This process was neither efficient nor family friendly. To minimize handovers it was common to delay the start of the permanent prescription until after discharge. This is also difficult for families as it necessitates additional outpatient appointments and can increase their costs by extending interim rental fees.

An additional challenge is demonstrated by the fact that many inpatients have seating and mobility needs that are complex and as a result, beyond the expertise of the inpatient therapist. This resulted in frequent requests for consultation by an outpatient seating therapist. In a large hospital such as Holland Bloorview therapists are often specialized and the primary focus of inpatient therapists is remediation of deficits caused by trauma, illness or operation. An experienced seating therapist on the other hand has a different focus. They can identify the many factors that affect the usability of the equipment and can anticipate and mitigate problems that may result in significant expenses, user inconvenience or even abandonment of the wheelchair.1

These findings suggested that it would be beneficial for the hospital to create positions for an additional dedicated seating therapist (1.0 FTE) and therapy assistant (0.5 FTE). These positions could be shared across the inpatient and outpatient seating as required. The goal of these positions were: to provide seating and mobility expertise to the inpatient team, decrease equipment delays on admission, allow prescriptions to begin as an inpatient and provide consistent post discharge follow through.

In order improve the timeline for providing loaner equipment, two avenues were explored: assessing surgical clients pre-operatively and performing pre-admission assessments at the primary referral source for inpatient rehabilitation, The Hospital for Sick Children (Sick Kids).



Pre-operative assessments allowed wheelchair and seating requests to be sent prior to admission. This addressed some of the delays however since some post-operative needs can not be anticipated, adjustments were frequently required to allow use of the wheelchair. The inpatient therapists at Sick Kids did not have adequate time nor did they feel equipped to complete or assist with these assessments. Having a Holland Bloorview seating therapist travel to Sick Kids to perform pre-admission assessments was trialed but was not effective. Travel to the hospital and coordination of patient availability was time intensive. Additionally, frequent last minute notification of referral made pre-admission assessment impossible. A pre-post analysis of retrospective data of equipment delivery showed a decrease in the number of clients waiting greater than 48 hours for equipment with the addition of the inpatient seating position but this timeline was still felt to be too long (see graph).

This phase of the project decreased the consultation requirement of the outpatient therapist. In addition, it enabled commencement of equipment prescriptions as an inpatient and allowed the same therapist to continue with the clients as outpatients. Unfortunately there still remained a delay for inpatient clients to receive their loaner seating and mobility equipment on admission to Holland Bloorview.

Partnership with Sick Kids

Since assessments pre-operatively or at Sick Kids were ineffective, the final phase of the project focused on addressing gaps in seating service occurring in acute care. It was found that Sick Kids was challenged to provide high quality seating services due to lack of expertise. The therapists did not feel equipped to optimally fit seating and mobility devices for their clients impacting their clients function and potentially resulting in safety risks. Additional limitations exist with the funding system in Ontario as funding is not available for a child to access services from a rehabilitation hospital while still a patient in acute care. As a result, wheelchair prescription by a Holland Bloorview therapist could not begin while the client is a patient at Sick Kids.

As a means of addressing the gaps in service grant funding was requested for a pilot project to create a seating services partnership between Sick Kids and Holland Bloorview. In this pilot it was proposed that a Holland Bloorview therapist (0.5 FTE) would work on site at Sick Kids addressing acute care seating needs. This position would have a dual reporting structure to ensure connections to both facilities. Grant funding was received from the Toronto Central Local Health Integration Network and an additional 6 months was received from the Holland Bloorview Foundation and as a result, the total project duration was set at 12 months.

The target population for the pilot project was clients with seating and mobility needs that were transitioning either home or to rehabilitation. Out of scope of the project were non urgent clients requiring adjustments to existing seating and mobility devices which could be completed as an outpatient. The initial goals of the project were to increase access to seating services in the acute care setting in order to facilitate a client's discharge home (target of 16 clients over 6 months) and to improve timeliness of equipment setup on transition to rehabilitation (target of 60% of clients with equipment set up on day of admission).

In the first 6 months of the project 13 clients were provided with seating services intervention to facilitate discharge home. Patient needs included prescription of seating equipment, assistance with rental equipment to ensure fit and function and modifying the client's own equipment to allow ongoing use. This number was slightly less than targeted as 5 clients receiving this service progressed and were discharged to rehabilitation rather than home thereby being excluded from this group. Of 56 clients slated for rehabilitation discharge to Holland Bloorview from Sick Kids over a 5 month period, 91% had their seating and mobility equipment in place on the day of admission (see graph). Both of these reflect improvements in patient care and the discharge process which were established as primary goals of the project. Family and staff satisfaction surveys were completed showing strong support for the project.

The combination of the three projects have decreased overall workload for the outpatient seating therapists resulting in the initial wait time for assessment to achieve the target of less than one month.

Conclusion

The seating services process improvement project at Holland Bloorview began simply, by trying to better manage workload of clinicians, shorten wait times and improve the experience of clients and families. We discovered that the continuity of service and expertise needed to be considered across acute care, inpatient/outpatient rehabilitation and the broader community. By introducing dedicated seating therapists to acute care and inpatient rehabilitation while re-directing our adult clients to other appropriate centres, we have shown improvements in family satisfaction and timelines, increased access to service and increased the seating expertise at Holland Bloorview and in the pediatric community.

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PS3.2: Increasing Assistive Technology and Interprofessional Online Training

Mary Goldberg, M.Ed

This paper focuses on literature that suggests online assistive technology training, especially in continuing education, should be used to increase interprofessional training and resultant quality of care. Interprofessional training, or interactive and group-based education aimed at improving collaborative practice (Parsell & Bligh, 1999), benefits from online learning. Offering interprofessional education online can help with scheduling logistics, allowing students to learn with and from each other, and promoting reflection and critical thinking through asynchronous components. There are approximately 55 programs in 27 states conducting AT training for formal credit, which includes graduate or undergraduate credit or degrees, continuing education units (CEUs), and/or AT credential (Jans & Scherer, 2006). Half of these programs offered distance learning though less than 20% reported that students could complete more than 80% of the course work through e-learning mechanisms, despite the emergence of open-source technology and simulation-based tools that could support even the most traditional hands-on experiences like internships. Sax (2002) suggests distance learning methods can be effective for teaching practicing professionals, especially when they include personalized attention to individual learning needs of the students.

In both in-person and online contexts for both the assistive technology field and beyond, clinicians have noted a shortage of relevant CE programming (Rappolt & Tassone, 2002). Strategies are needed to make more efficient use of available educational programming. Friedland et al. (2000) demonstrated how repackaging of an advanced entry-level rehabilitation course into a format accessible as CE increased the availability of new knowledge to practicing clinicians. Knowing that evidence based practice increases quality of care, and that interprofessional education may also increase quality of care, learning opportunities resulting in these outcomes should be encouraged. Stucki (2007) suggests most clinicians, do not have the possibility of, or sufficient interest in, taking 1 or 2 years out of their clinical work to obtain additional training related to research or other disciplines that may result in a Masters' degree. However, many clinicians across professions and disciplines may be able to commit themselves to a certificate program of 6–9 weeks duration. To meet the needs of these participants, programs should include flexible scheduling, a reasonable amount of e-learning (distance learning), and self-learning credits. Therefore, feasibility of technological media for continuing education in assistive technology including telehealth and web-based courseware, should be examined.

The AT prescription process, especially related to wheeled seating and mobility, is by nature multidisciplinary and should include involvement and empowerment of the user as a decision maker (Reed et al., 1995), thus resulting in better client care as recommended by interprofessional training. The post-professional credential, the Assistive Technology Professional designation, is held by occupational and physical therapists, suppliers, speech language pathologists, audiologists, and rehabilitation engineers in addition to others who would play a role in prescribing, creating, or evaluating AT (RESNA, 2009). Therefore, AT education offers an opportunity to engage in interprofessional training as it attracts clinicians and students of various backgrounds. According to the World Health Organization, interprofessional education can develop the ability to share knowledge and skills collaboratively, enable students to become competent in teamwork, decompartmentalize curricula, integrate new skills and areas of knowledge, ease interprofessional communication, generate new roles, promote interprofessional research, improve understanding and cooperation between educational and research institutions, permit collective consideration of resource allocation according to need, and ensure consistency in curriculum design (Yan, 2007).

Online learning is perceived to not only assist in creating a community of learners (Bransford, Brown & Cocking 1999; Riel & Polin 2004; Schwen & Hara 2004; Vrasidas & Glass 2004) but also increase self-reflective learning when conducted asynchronously (Harlen & Doubler 2004; Hiltz & Goldman 2005; Jaffee et al. 2006). Setting up an online environment that is conducive for interprofessional learning requires the integration of critical components that include both teaching pedagogy and delivery mechanism to in turn develop the community of learners and self-reflective learning tendencies that increase the efficacy of the experience. Barr et. al (2005) suggest a combination of the following pedagogies, each of which is illustrated with a characteristic example of the teaching: exchange-based learning, e.g. debates and case studies; action-based learning, e.g. problem based learning; observation-based learning, e.g. students from different professions jointly visit a client or shadow another profession; simulation-based learning, e.g. role-play, games, labs, and experiential groups; practice-based, e.g. co-location across internships or practicums; e-learning, e.g. reusable learning objects relating to the above mechanisms; blended learning, e.g. combining e-learning with face-to-face learning; and didactic learning, e.g. lectures. In terms of delivery, many open-source learning management systems (LMS) have innate functionality to support the mechanisms required to facilitate interprofessional learning. CourseSites by Blackboard, Moodle, ATutor, and OpenClass are currently used by organizations offering continuing education and other training opportunities online. For example, on "CourseSites", instructors can host up to 5 courses at any given time and "enroll" unlimited students. The "CourseSites Live" function is a real time collaboration tool to support teaching and learning. It includes chat, Voice over IP, application sharing, and a whiteboard. Instructors can include up to 50 total participants at a time in a CourseSites live session. A tool like CourseSites Live can facilitate exchange-, action-, and simulation-based learning as described above. Likewise, even a simple discussion board can facilitate a case study exercise. The instructor can post a prompt, for example about a client requiring a new mobility device for independence in the community based a variety of constraints, and trainees can weigh in on a variety of solutions. Archiving is simple on both a sophisticated platform like CourseSites Live or a simple mechanism like a discussion board, capturing both oral and written communication, and allowing trainees to asynchronously access content when necessary.

Several pre- and post-professional health science training programs, some of which have been evaluated and disseminated through peer-reviewed articles, use some of these innovative mechanisms. Crawford et al. (2010) surveyed physical therapy clinical education coordinators about remote, particularly international in this case, internship opportunities and challenges. The majority of respondents (83%) reported that PT students were required to be supervised by an on-site physical therapist. Other supervisory models reported were "virtual" supervision online by a physical therapist or university faculty member and supervision by an on-site health care professional from another discipline (e.g. nurse or physician). Similarly, Maciel (2009) and Bollela (2009) described effective remote clinical internship tutoring and management through the e-learning client Moodle. Wunschel (2009) illustrated the effectiveness of an 'Inmedea-Simulator', a web-based virtual hospital environment integrating the complete orthopaedic curriculum. A script was composed for each patient, which listed personal characteristics, including complaints, symptoms, social status, hobbies, etc., as well as the frequency and dates of clinical visits. Students who completed the patient case studies highly rated the experience. These options may also be feasible for AT training in remote locations, suggesting that the future of internships and other simulation-based learning may be found online.

This paper suggests assistive technology online training developed using best practices and appropriate pedagogy, especially within continuing education, is needed. AT online education offers an opportunity for professionals of different backgrounds to learn together. Interprofessional training and communities of practice can ultimately enhance client outcomes and should be encouraged (Farrell, 2005). With a documented shortage of both formal and continuing education programs in assistive technology, innovative training programs that prepare individuals to sit for the RESNA ATP exam are needed. Facilitating online sessions that create group-learning opportunities allow students to increase self-reflectivity and learning outcomes due to learning from each other's distinct backgrounds and experiences.

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PS3.3: Specialized Clinical Affiliation in Seating and Mobility

Penny J. Powers, PT, MS, ATP
Renee Brown, PT, PhD
John Hackett, PT, DPT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Evaluate current practice setting to determine if their setting is appropriate for a clinical learning experience.
2. Describe three areas for meaningful development for novice practitioners in seating and mobility.
3. Apply principles learned in seating and mobility to other areas of practice.

In collaboration with Belmont University Program in Physical Therapy, Pi Beta Phi Rehabilitation Institute's Adult Seating and Mobility offered the first full-time (8 week) clinical affiliation. It was offered to students who wished to pursue this area of practice; no student was arbitrarily assigned this affiliation. The outcome was successful and there are plans to offer this option in 2013.

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PS3.4: Ultra-light manual Wheelchair Prescription Pattern: Can it be influenced?

Rosemarie Cooper, MPT, ATP
Cordelia Wilson, ROTC

Abstract

This paper investigates the clinical practice related to manual wheelchair recommendations by addressing the characteristics and trends of the prescriptions made for ultra-light chairs and their users, along with the related significance of shoulder injury prevention. The Learning Objectives are to determine - based on 147 ultra-light manual wheelchair prescriptions, from 2009 to 2012 at the University of Pittsburgh Center for Assistive Technology - whether: 1) Current clinical practice reflects PVA-clinical practice guidelines 2) the demo chair is appropriate for encouraging compliance with PVA guidelines 3) the supplier, therapist and/or end users are influenced with in terms of their final recommendations according to these guidelines. The information within this paper is collected from the wheelchair prescription database housed within the University of Pittsburgh Center for Assistive Technology (CAT). Specific data points reviewed is focused on the connections between dimensions of frame, type and model of chairs, and the diagnosis and physical characteristics of the user. Our preliminary results indicate that there is a trend towards prescriptions for smaller frame sizes, indicating a compliance with the PVA guidelines.

Introduction

In spring 2011 an 18 year old female diagnosed with SCI -T10 due to a MVA in summer of 2010 was seen at the University of Pittsburgh Center for Assistive Technology (CAT) for an re-evaluation of her current 18" W by 18" D Q7 ultra-light manual wheelchair, she was fitted for upon her discharge from Rehab in 2010. The problem listed at time of her visit in 2011 at CAT was a sacral Stage II pressure ulcer and shoulder discomfort during independently self propulsion as well as difficulties maneuvering the chair within tight areas of her home. The excess width of the chair frame related to stress onto her shoulder joints and the excess depth of the seat contributed to a posterior pelvic rotation related to the sacral sore.

The PVA guidelines stress efficient positioning of body and propelling in the chair. For example, the ideal seat height is when the angle between the forearm and the upper arm is anywhere from 100 to 120 degrees with the hand resting in the center of the push rim [#1]. Shoulders are better preserved when the arms are closer to the client's trunk when propelling, which reinforces the importance of more narrow chairs. After close evaluation and trial of demo chairs at CAT, the therapist recommended Ms. Doe to trial a 14"W X 16 D frame – an appropriately sized demo chair was not available at time of visit and had to be custom ordered. The client has been using her 14 x 16 sized chair successfully for the last year and the narrow adjustable ultra-light wheelchair allows her to use appropriate biomechanics during self-propulsion, exposing her shoulders to less stress that in turn preserves her upper limbs and is in compliance with the recommendation as outlined in the PVA upper body preservation guidelines.

Ultra-light manual wheel chairs are available in three types of chairs: rigid, suspension, and folding. Each type of chair offers adjustability to the user's lifestyle, whether providing better propulsion, easier transportability, or durability when performing wheelies and jumping curbs. Proper fitting of the chair requires that the user feels the chair is an extension of him / herself [#3]. The ultra-lights are set up with a forward-rearward adjustment of the rear axles which calibrates the user's center of gravity in in direct relationship with the wheels - based on the anatomy, motility skills and balance of the end user [#3]. The features promote compliance with the guidelines and healthy biomechanics, and it is important for the end user and their therapists to evaluate these benefits during clinical test trials. This may be complicated by the fact that manufacturing wheelchair companies are downsizing available products and chairs. The decisions of various companies to downsize also impacts availability of different sized frames. The lack of diversity in the marketplace itself proves difficult for the end user and therapist to participate in locating the appropriate chair and fit. RESNA (Rehabilitation Engineering and Assistive Technology Society of North America) made efforts to require an Assistive Technology Professional credential to educate therapists and suppliers on proper technology; however, there are still many who lack the knowledge to prescribe the appropriate equipment [#2]. In addition, limited variation in frame reduces chances of prescribing chairs that follow the guidelines for preserving the upper body.

In order to see if a closer look into the clinical prescription and education of the end user, recognizing that there are challenging trends within the industry and that availability of appropriate sized demo chair are not that common and may require custom orders, CAT's decided to add a 14"W x 16" D ultra-light rigid wheelchair chair to the available trial equipment in August 2011.

Hypothesis

1. With the addition of 14"W x 16" D ultra-light rigid wheelchair chair to the available trial equipment, more users, therapists, and suppliers were influenced with their final decisions to consider and include these smaller frames.

Research Design and Method

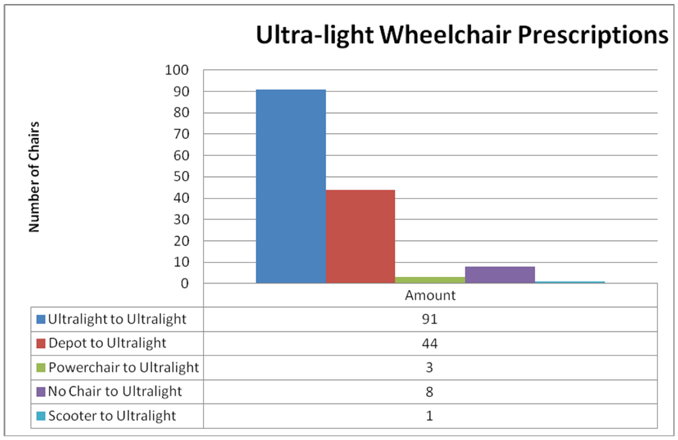
Project was conducted at the University of Pittsburgh Center for Assistive Technology. Analysis of previously collected data from 147 ultra-light manual wheelchair users was conducted to determine manual wheelchair prescription trends from 2009 to 2012. The medical records of all individuals utilizing an ultra-light wheelchair and evaluated at CAT was reviewed and incorporated into data analysis.

Data Collection

Demographics: Personal demographics included age, height, weight, and diagnosis. Wheelchair information on current type of chair and recommended frame size was noted.

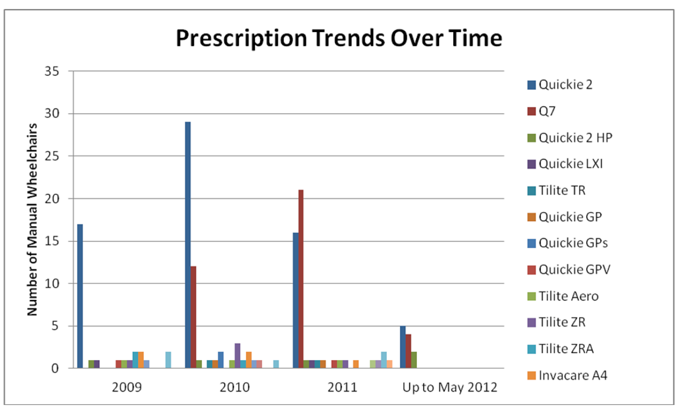
Results

Graph 1.



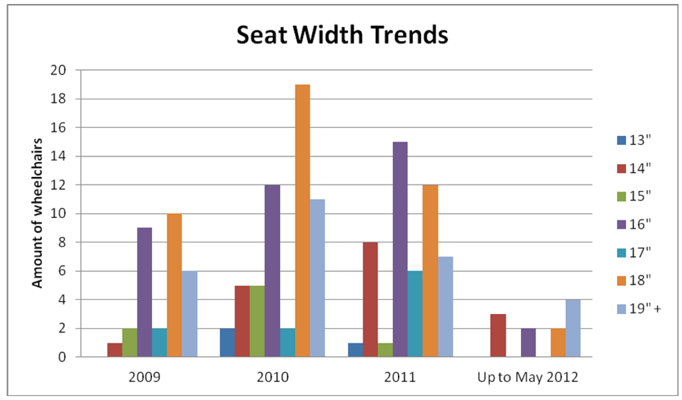
61.9 % of end users switched the models within category of ultra-lights (ultra-light to ultra-light); of note: 29.9% switched type of manual chair (depot chair to the ultra-light).

Graph 2.



Note: 10-14 models prescribed in 2009 to 2011; 3 models prescribed in 2012.

Graph 3.



Percentage of </= 14” frames for year: 2009 - 3.3%; 2010 - 12.5%, 2011 - 18%, 2012 - 27.2%

Table. 1

Demographics of the 22 clients in </= 14” frames			
Height/Weight Range of Clients		Type of Diagnosis	
Average Height	5’2”	Spina Bifida	9
Average Weight	116 lbs.	SCI (cervical)	3
Tallest Client Height	6’5”	SCI (thoracic)	2
Tallest Client Weight	172 lbs.	Amputation	1
Shortest Client Height	3’0”	Paraplegia	3
Shortest Client Weight	52 lbs.	Neurological Progressive	4
Heaviest Client Height	5’4”		
Heaviest Client Weight	190 lbs.		
Lightest Client Height	52 lbs.		
Lightest Client Weight	3’0”		

Table. 2

Demographics of the total 147 clients in ultra-lite manual wheelchair				
	2009	2010	2011	Up to May 2012
Total Clients	30	56	50	11
Average Height	5’4”	5’5”	5’4”	5’5”
Average Weight	165 lbs.	168 lbs.	156 lbs.	182 lbs.
Tallest Height	6’4”	6’5”	6’8”	5’11
Tallest Weight	200 lbs.	201 lbs.	300 lbs.	230 lbs.
Shortest Height	3’0”	4’.5”	2’9”	4’3”
Shortest Weight	52 lbs.	164 lbs.	25 lbs.	70 lbs.
Diagnosis:				
Spina Bifida	9	11	15	2
C injury-SCI	1	4	2	1
T injury –SCI	5	7	9	1
Amputation	0	1	6	1
Paraplegia	5	12	6	1
Neurological Progressive	2	8	6	4
Brain Injury/ damage	6	4	6	0
Other	2	9	0	1

Discussion

Our results indicate that our hypothesis was correct and that users, therapists, and suppliers were influenced with their final decisions to consider and include smaller frames. The graphs show the prescription trends in CAT regarding ultra-light manual wheelchairs. The limitation of this project is that the information reviewed was solely from CAT. The purpose of Graph 2 is to show the decrease of model availability within the clinic. Despite this challenging trend in industry, Graph 3 indicates an increase in narrow chairs from 3% to 27% over the years 2009 to May 2012. Table 1 displays the ranges of users in a 14" and lower frame that indicate a narrower frame can be used for various demographics in end users. Even though information in 2012 only includes up to May, the information demonstrates consideration of the guidelines on preserving upper limbs as well as a more positive influence of the demo chair towards end users, therapists, and the suppliers. Table 2 displays the overall demographics of the 147 clients reviewed and shows that prescription trends were not influenced by the population as a whole. The weight and height of the everyday user remained relatively the same until 2012 where there was a slight weight increase. Despite the 20 lb. weight gains in the general population of 2012, the 14" frame prescription increased positively enforcing the concept of moving towards smaller chair frames, therefore, the prescription towards more appropriately sized chairs was not due to the demographics of the total population but rather the addition of the 14" chair to the clinic.

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Friday

March 8, 2013

IC25: Research is a Necessary Evil

Shirley Groer, PhD

Learning Objectives:

1. At the conclusion of this workshop, participants will be able to:
2. Describe three basic research designs that could be used in answering clinical questions.
3. List five things a person should assess when reviewing research articles.
4. Describe five items that should be taken into consideration when completing research.

Quality assurance! Justification for services! These are things that are at the forefront of many discussions about healthcare. The ability to adequately assess the quality of our services or provide evidence of the need is crucial. This session will provide some basics in understanding research and how it can be used successfully for your needs.

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IC26: Tissue Trauma… Tilt in Space … Surfaces….

Jane Fontein, OT

Introduction

How many therapists receive a referral to provide a new cushion for client as they have a pressure sore and it is thought that the cushion was the cause? Often after a thorough assessment it is not the cushion but any number of surfaces that may have caused the pressure ulcer, perhaps the commode chair. It doesn't matter how great a cushion that may be provided for client the skin will perhaps heal but then have trouble again if the original cause of the sore is not determined or addressed. It is not always easy to determine what the initial cause of the pressure ulcer is unfortunately. A full seating assessment should be done as opposed to just providing a "pressure relieving" cushion with a holistic approach to the healing of the ulcer.

Seating Assessment Process Overview

- Pre Mat Assessment/Interview
- The Mat Physical Assessment
- Set Learning Objectives/ goals
- Determine product parameters
- Possible product options
- Trial of equipment
- Prescription and letter of necessity
- Delivery and fitting
- Follow up

Pre Mat Assessment

This includes but is not limited to the medical history

Current seating system

The Mat Assessment – supine and prone

Skin Assessment
(Review pressure ulcer stages)

Visual assessment/ hands on assessment

Nutrition

Habits…smoking

Causes of pressure ulcers –
- Pressure
- Heat/ Moisture
- Friction/ shear
- Trauma

Support surfaces to explore – basically every support surface the client comes in contact with:

- Wheelchair
- Bed
- Commode
- Car/travel
- Bathtub
- Sofa
- Sports.. etc

Set Learning Objectives/ Goals of seating –

There are some general seating and mobility goals as well as client specific goals:

- Heal and or prevent development of pressure ulcers
- Skin education
- Sitting tolerance
- Decrease pain
- Comfort and function
- Improve and or maintain posture
- Maintain current level of independence
- Prevent deformity

Product Parameters or features

The dimensions determined in the seating assessment such as width and depth as well as the properties that are desired such as weight considerations of the products, transport, tilt, recline, maintenance level, colour,

Cushion specific – pressure reduction possible material such as foam, air, gel, fluid...

Product options
These are determined with the features in mind often with the supplier.

Trial of equipment
It is important to try the equipment. Equipment may be right on paper but in practice it may not work. Trials can be a difficult as obtaining all the trial equipment with the required size and set up is not always possible.

Prescription and letter of necessity

Delivery and fitting
Often a time of final changes and fitting

Follow up
In the perfect world, follow up is done as it is important to know if the goals were achieved and even if the prescribed equipment is being used.

Clinical Reasoning Worksheet sample

Clinical Reasoning Worksheet sample

Client	Assessment Findings	Client Objectives Functional goals	Product Features	Product options	Outcome measures
Pelvis Lower Extremities Trunk Upper Extremities Head and Neck General					

Summary

When dealing with a pressure ulcer it is important to do a full seating assessment including all surfaces the client comes in contact with in order to help determine the possible solutions for seating and mobility.

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1. Chan A, Heck CS. The Effects of Tilting the Seating Position of a Wheelchair on Respiration, Posture, Fatigue, Voice Volume and Exertion Outcomes in Individuals With Advanced Multiple Sclerosis. J Rehab Outcomes Meas. 1999;3(4):1-14
2. Mark R. Schmeler, M.S. OTR/L,ATP, Michael L. Boninger, M.D., Rosemarie Cooper, MPT,ATP and Megan Vitek, Using Peer Reviewed Literature and other Evidence to Justify Wheelchair Seating & Mobility Interventions. International Seating Symposium. 2002.
3. Wendy Moffett, Lynn Shaw and Jan Miller Polgar. An Evidence-Based Protocol for Investigating Seated and Back Pressure for Wheelchairs, School of Occupational Therapy, Western University, London, Ont."
4. Cook, AM & Polgar, JM. (2012). Essentials of Assistive Technology, St.Louis, MO: Elsevier.
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IC27: 24/7 Pressure Management in the Acute Rehab Setting

Steven M. Dahling, ATP
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Allison Kearney, MS, OTR/L, ATP
Talia Mouldovan, OTR/L

Learning Objectives

1. At the conclusion of this workshop, participants will be able to:
2. Identify a minimum of three correlations between pressure ulcers and positioning biomechanics.
3. Describe the pressure ulcer assessment process and the impact that interface pressure mapping has on the assessment and intervention phase of clinical pressure management.
4. Appreciate the need for a trans-disciplinary approach to managing pressure ulcers in the acute care setting.

Hospital acquired pressure ulcers affect approximately 2.5 million Americans in acute care settings each year. Interventions that prevent or treat pressure ulcers potentially reduce costs and improve quality of life. Health care providers are increasingly challenged to address this issue and develop innovative mechanisms to maintain skin integrity and prevent future pressure ulcers.

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4. Dorner, B., Posthauer, M.E., Thomas, D. The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper. 2009.

IC28: An Update on the Separate Benefit for Complex Rehab Technology Under Medicare

Elizabeth Cole, MSPT
Laura Cohen, PT, PhD, ATP

Complex Rehab Technology (CRT) products and associated services include medically necessary, individually configured devices that require evaluation, configuration, fitting, adjustment or programming. This can include individually configured manual wheelchairs, power wheelchairs, adaptive seating systems, alternative positioning systems and other mobility devices. These products and services are designed to meet the specific and unique medical, physical, and functional needs of an individual with a primary diagnosis resulting from a congenital disorder, progressive or degenerative neuromuscular disease, or from certain types of injury or trauma. The devices are critical to allow these individuals to maximize their function and minimize the extent and costs of their medical care.

Significant challenges threaten access to CRT products and their supporting services due to current coding, coverage, and payment policies. A primary factor responsible for these problems is that CRT products do not have a distinct Medicare benefit category. Instead, they are grouped with standard Durable Medical Equipment (DME) within the broad Durable Medical Equipment Prosthetics and Orthotics (DMEPOS) benefit category. DME is defined as an item that is able to withstand repeated use, such as an item that could normally be rented and used by successive individuals or a standard commodity product. CRT products, however, like prosthetics and orthotics, are configured, fit and programmed for a specific individual.

Including the more complex CRT in the same benefit category as standard DME products does not allow adequate differentiation when it comes to establishing coding, coverage and payment policies, and quality standards. This has created a number of access and reimbursement issues over the past several years and, without meaningful change to existing policies, this will only get worse. For example, coverage criteria for seating products introduced in 2005 were based solely on ICD-9 diagnoses codes with no regard for functional or physical needs and/or risk factors for skin breakdown and postural deformities. Significant reimbursement cuts for power wheelchairs in 2006 occurred due to perceived overpayments and over-utilization of standard power wheelchairs, yet the cuts went across the board and affected CRT power wheelchairs as well. The new policy also included stringent and burdensome documentation requirements for both standard and CRT power mobility. Similarly, a 9.5% cut in reimbursement occurred for all seating and mobility products in 2009 to offset the delay in the competitive bidding program for DME. This affected CRT power wheelchairs despite their exclusion from the competitive bid program

In order to rectify this fundamental problem, an initiative is underway to secure a separate benefit category within the Medicare program. Our goal is to secure a separate benefit within the DMEPOS category to (1) recognize the specialized nature of CRT products, (2) recognize the supporting processes and services that are required for their provision and account for the related costs, (3) establish appropriate coverage criteria and documentation requirements for CRT and (4) require appropriate accreditation of the providing CRT companies and appropriate credentialing and competencies for the qualified suppliers. This is similar to the "carve out" for prosthetic and orthotic devices and is critical in order to improve and protect access to CRT products and services for individuals with complex disabilities. The main issues, the Learning Objectives for the separate benefit category, and the proposed provisions to achieve these Learning Objectives are summarized as follows:

Coverage Policies

Currently there are requirements within the DME coverage policies that inappropriately limit the availability of certain products to people with disabilities. Some of the coverage criteria are vague and limited in scope, while others are overly prescriptive and/or are based on diagnosis code alone. The separate benefit will develop clearer and more consistent coverage policies for CRT that will be based on the beneficiary's functional capacities and limitations, rather than on specific diagnoses or other highly prescriptive and limiting criteria. In addition, a pathway will be established such that beneficiaries who are seeking wheeled mobility and have certain diagnoses and/or clinical presentations will be required to go through an appropriate seating and mobility evaluation conducted by experienced clinicians to determine if these individuals are appropriate for standard DME or for CRT. This added safeguard will ensure that every beneficiary receives an evaluation for the most appropriate equipment and that those with less obvious complex disabilities do not "fall through the cracks".

Another provision in the separate benefit will be to shift the primary weight for clinical documentation from the physician to the Occupational Therapist and/or the Physical Therapist. Documentation requirements will be appropriate and clearly defined to help reduce unreasonable administrative burdens. And Medicare's "in-the-home" restriction, which ignores a beneficiary's needs outside the home environment, will be eliminated for CRT. Finally, CRT will be covered in Skilled Nursing Facilities for beneficiaries who could transition into the community if provided with these assistive products.

Supplier Standards

Due to the complex nature of CRT, providers of these products should have a level of skill and expertise beyond that needed to provide standard DME. Higher supplier standards and professional credentials are required to ensure that beneficiaries' needs are matched with appropriate products through a professional process and to ensure that there is an adequate system in place for providing ongoing service and repair needs. The separate benefit will establish stronger and more enforceable Supplier Standards to promote appropriate clinical outcomes and consumer protection. Among these standards is the requirement that the company providing the CRT must have the capability to service and repair all equipment it supplies. It also must employ at least one qualified rehab technology professional (RTP) per location who has earned credentials to demonstrate additional evidence of competency in the provision of seating and mobility (ATP plus an additional credential).

Coding and Payment

The current reimbursement for CRT does not recognize both the cost of the product and the cost of the services required to provide these products, including assessment, configuration, fitting, modification, assembly, simulation and follow-up. To produce an equitable payment system, the significant product costs and product-related service costs must be recognized and factored in when establishing reasonable fee schedules. The separate benefit will obtain formal recognition of the product-related services and costs involved to allow for reasonable reimbursement amounts.

In addition, the current coding system does not differentiate the full breadth of available technology. With the separate benefit, existing HCPCS codes that currently define pure CRT products will be moved into the new benefit and will only be available through accredited CRT companies. New CRT codes will be created where existing codes contain both CRT products and non-CRT products in order to segregate these products. New codes will be created for "uncoded" CRT products that are routinely provided but currently do not have an assigned code. Product quality standards will be established for CRT products.

All CRT products would be exempt from any competitive bidding programs. The current gap filling pricing methodology will be modified for CRT codes and these codes will be re-priced and include the annual CPI index increases awarded to Orthotics and Prosthetics since 2000.

Payment Stability

The CRT available today that provides function and independence for individuals with disabilities is the result of research and innovation that has occurred over a number of years. For this consumer-centric product development to continue there must be a business and regulatory environment that fosters these activities and promotes access through appropriate coverage and payment. The separate benefit will provide future payment stability to ensure continued access to medically necessary products and services and an environment that encourages product innovation and technological solutions.

A Model Program

Many state Medicaid programs and other third-party payers adopt the policies of the Medicare program. This often creates problems with access and reimbursement for individuals under these other funding sources. The separate benefit will produce an improved coverage and payment system that can serve as a model for these other payers and protect and improve access to CRT for these individuals.

What Has Been Accomplished?

The initiative to create the Separate Benefit for CRT began in 2009 with a small steering committee composed of representatives from the National Registry for Rehab Technology Suppliers (NRRTS), the National Coalition for Assistive and Rehab Technology (NCART), the American Association for Homecare (AAHomecare), the Rehab Engineering and Assistive Technology Society of North America (RESNA), the Clinician Task Force (CTF) and the United Spinal Association (USA). A discussion paper and proposal outlying the Learning Objectives and goals of the project has been drafted and put out to stakeholders for feedback and consensus. Since then, numerous national stakeholder, consumer and disability organizations have weighed in to support the project.

A Washington DC firm was hired to develop a "roadmap" that outlined what should be accomplished through Congressional legislation and what should be accomplished through regulatory changes made by CMS once the separate benefit is passed by Congress.

Legislation mandating the creation of the separate benefit was drafted and stakeholders in the industry (suppliers, clinicians and consumers) presented this to members of the House and the Senate during meetings in both home offices and in Washington. An analysis by an independent consulting firm estimated Medicare's cost for the separate benefit to be ~$56,000,000 over 10 years, which is a minimal cost considering the scope of the entire Medicare budget. In April of 2012, Representative Crowley (D-NY) introduced this legislation as HR4378 "Ensuring Access to Quality Complex Rehabilitation Technology Act of 2012". As of the writing of this paper (November 2012), thirty-seven bipartisan members of Congress had signed on in support of this bill.

While work was being done to create the legislation to enact the separate benefit, several work groups were created to develop proposals for appropriate and necessary changes in coding, coverage criteria, reimbursement, documentation and supplier standards for CRT. This work diligently continues at the time of the writing of this paper. These proposals will be presented to CMS once the legislation is passed.

Going forward, efforts are being made to obtain more support for the bill in the House as well as to find a "champion" for a companion bill in the Senate. The cost of the separate benefit will need to be officially scored by the Congressional Budget Office. And once a critical mass of cosponsors is attained, the bill can go before Congress for passage either as a stand-alone bill or as an attachment to a larger bill.

What Can You Do To Help?

The Separate Benefit for CRT needs help from all stakeholders to ensure that the legislation is passed. It is especially important for each member of Congress to hear from clinicians, consumers and any constituent within his/her district. To that end, a website dedicated solely to CRT has been created and can be accessed at www.access2crt.com. Numerous resources are available for further information on CRT and the separate benefit. The website also has an updated list of all members of Congress who have signed on to the legislation. And it provides a very quick and easy way to contact your specific Representative and Senators along with a pre-written message urging your member to take action. You can send the message as is or personalize it to reflect your interest and stake in the project.

Complex rehab technology products and services are critical to allow individuals with complex disabilities and medical conditions to function in their everyday lives safely, efficiently and to the fullest. However, the ability to access these products is being threatened by policy changes resulting from issues with standard DME products. Separating CRT from standard DME in the Medicare benefit is critical to preserve and protect access to these products for these individuals. It is essential for each of us to get involved and fight for this all important initiative.

Please note that this paper was written in November 2012 in order to be included in the syllabus. Further updates will be presented at the time of the conference in March 2013.

IC29: Wheelchair Management in Acute Care – From Inventory to Innovation

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Introduction

Effective resource management has long been promoted in healthcare, but emergent issues act as drivers of change, abruptly modifying practice. The management of a wheelchair and seating equipment pool at a tertiary hospital demonstrates the need to meet environmental demands in a way that is systematic, yet flexible and responsive in the face of new contingencies.

- Who are we...Toronto Western Hospital (TWH) is part of the University Health Network (UHN), Canada's largest academic healthcare organization. TWH is a world leader in the neurosciences, but also has strong general internal medicine, geriatric, musculoskeletal health and arthritis, and surgical speciality programs. Additionally, the Emergency Department treats more than 40,000 patients annually. TWH is situated in an exceptionally economically diverse and multicultural urban neighbourhood.
- …What is the problem? Wheelchair management in a large, shared resource environment crossing numerous medical and surgical areas.

Learning Objectives

This presentation will recount four distinct phases in mobility system management over one decade:

1) Creation of an inventory-tracking system - facilitating the development of a multi-year equipment enhancement and replacement plan:

If you don't know what you have, you don't know what you need! Without an inventory-tracking system it is not possible to accurately accomplish 5 key tasks:

- Identification of equipment purchased through specific program or departmental budgets (including responsibility for maintenance and replacement);
- Tracking where equipment is located at any point in time;
- Determining the equipment needs of your patient/client populations;
- Planning for equipment retirement; and
- Long term budgetary planning to facilitate equipment purchases.

2) Initiation of an annual maintenance program - to ensure the safety of occupational therapy mobility equipment, and meet multiple regulatory requirements:

A general state of disrepair…Completion of a hospital-wide inventory of all seating and mobility equipment lead to the realization that it was in poor or unsafe condition – not even meeting relatively lax Departmental Safety Standards. It was discovered that there were safety issues related to brakes, and broken or missing components, with an apparent lack of skill and/or appropriate tools with which to maintain TWH wheelchairs. As well, there were no guidelines to aid in decision-making related to equipment maintenance, retirement and replacement.

- To address these issues, annual equipment maintenance is completed by skilled technicians from a large durable medical goods company on a contractual basis.
- Detailed records are kept regarding each wheelchair's on-going preventative maintenance, increasing patient and staff safety, mitigating risk and reducing personal clinician and corporate liabilities.
- A stock of replacement parts for frequently damaged items such as brakes is always available to allow for ongoing and timely repairs of damages wheelchairs, with a trained occupational therapist assistant undertaking these time-sensitive repairs.
- The old Occupational Therapy Department 'Equipment Maintenance Policy' was revised and made fully operational, with accountability optimized.

3) Development of infection control policies and procedures - in the wake of Severe Acute Respiratory Syndrome (SARS):

Mobile islands of infection…An increasing number of Hospital Acquired Infections (C.difficile, MRSA, VRE) have been recognized as causes of morbidity and mortality in fragile populations. At one time, the precise role of cleaning in the control of these organisms was unknown (Dancer, 2004).

- Inadequacies were identified in hospital cleaning practices.
- Significant inadequacies were identified in the cleaning of seating and mobility systems.
- Policies and procedures existed – but there was no accountability within occupational therapy.
  — "Outbreaks" heightened awareness and provided motivation to examine best practices around cleaning procedures.
    - Open cell foam cushions were replaced with closed celled/sealed cushions.
    - No sharing of equipment between patients without a 'Terminal Cleaning.'
    - High temperature cleaning of moisture-wicking fabrics was initiated.
    - Mandating greater adherence in signing out equipment to allow equipment tracking.
    - Increasingly rigorous cleaning procedures, undertaken by both occupational therapists and occupational therapist assistants.
    - 'Terminal Cleaning' procedures were developed.
    - Monthly email to each occupational therapist listing wheelchairs requiring a 'Terminal Clean' if still being utilized by an admitted patient.
    - Cleaning to be done on the patient units to prevent cross-contamination.

- Cushions are transported to laundry sealed in bags.
- Staff accountability increased by clinician signing of policies and procedures when revised.

— Stakeholder partnerships were developed to create and to maintain institutional and cultural change to promote better infection control awareness and management.

4) The design and fabrication of new seating products to minimize the risk of transmission of hospital-acquired infections.

Nobody makes that? It was determined that no manufacturer had a closed cell or sealed personal-style backrest or headrest, and that most were covered backrests/headrests had moisture-wicking fabrics that served to wick pathogens into the open celled foam – not ideal for a multi-patient, shared resource environment.

- In collaboration with HME Limited and Future Mobility Healthcare, Toronto Western Hospital designed non-porous, cleanable back and headrest covers to cover new open cell foam backrests and headrests.
- Every wheelchair owned by Allied Health has had new backrests and headrests fabricated with the new covers.
- All other wheelchairs at Toronto Western Hospital have had new backrests and headrests fabricated and installed.
- All new wheelchairs will be purchased with the new backrests and headrests, as per the updated policy.

Approach

A review of these developments will focus on two imperatives:
1) The need for a systematic equipment management plan based upon foundational policies and procedures; and
2) The development of stakeholder partnerships to create and maintain institutional and culture change.

Practice Implications

Without a well-designed, integrated equipment management plan, sustainable change, and effective, rapid response to varied system drivers cannot occur.

Conclusion

The effective management of equipment that supports occupational therapy practice, serves as the basis for excellent, safe and client-centered care, and demonstrates accountable healthcare.leadership.

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IC30: Configuring Powered Mobility Systems for the First Time User

Karen M. Kangas, OTR/L, ATP
Lisa Rotelli

We will share how to configure powered mobility systems for individual first time users who have never had experience with independent mobility. Frequently, these are very young children or much older children who are challenged with complex bodies, are non-speaking, non-ambulatory, and may have many visual, auditory and/or sensory processing issues. These configurations are critical to the individual being able to learn and to become competent in the use of powered mobility. The configurations will change as the individual becomes more experienced. The day of delivery is NOT the day of a final configuration, but rather it is the day of an INITIAL configuration, which will change, and must change as the individual's experience expands.

These configurations include:

1. The actual physical configurations of the chair including all its physical components;
2. The programming the electronics
3. The configuration of a seating system which will support access to the environment
4. Learning/training strategies which really work.

As equipment for seating, access, and mobility is prescribed and subsequently implemented, frequently problems ensue when: 1) the chair is configured in its "standard" shipping mode or for an individual already competent in driving; 2) seating has been designed only to manage the body, rather than assist an individual in control of the body, 3) the individual's ability to process sensory-motor information is disregarded, 4). methods of access are presented or expected to function in a particular way, 5). the chair's electronics are inadequately or incorrectly programmed, and 6). driving skills are inadequately or incorrectly "taught" or supported..

To assist individuals in developing competency with powered mobility, these issues must be understood, acknowledged and configurations changed. Individuals who are in their powered systems for the first time are not going to demonstrate the skills they will develop over time. The configurations of their systems need to reflect this.

With the current programmable electronics, it is critical that their programming support "first time" use and then change when "skills and competence develop." Programming should also be reflective of the environments being learned, as well as the access type being utilized. Joystick driving's programming is very different than head array driving. We must recognize not just indoor and outdoor driving, but also levels of experience in managing and learning environments, and their accessibilities.

We will share specific configurations, and programming which works. We have both been supporting independence in powered mobility for over 20 years, and this knowledge of real experience has been honed by the individuals we have served. It is their input, their environments, and their use of systems and their experiences of success and failure that have created these configurations. This course will focus on seating,access, and mobility as they directly relate to functional independence and the continued development of competence.

The Physical Configuration of the Chair needed

In order to support learning mobility, not driving, the physical configuration of the chair must support independent control and mobility. The configuration must suit and be planned to work for both the child and the trainer.
For the Trainer:

The **visual display** needs to be mounted in the rear of the chair and within an easy viewing of the trainer. The trainer must know the programmability of the chair, and its current "modes." The child will not and should not be expected to manage a chair before she has even experienced making it go where she wants. The visual display should not be sticking out, nor sticking up and high. It should be mounted stably and as a part of the chair in the rear.

The **switch controller interface** must also be mounted initially in the rear for the trainer's access; NOT hidden. When training a first time user, the switch interface can be turned off, to pause and reflect, rather than turning the whole system off. The trainer must be able to easily turn on the chair, and the switches, so that the child's initial and immediate experience is control of moving the chair, not "turning the chair on or waiting."

The **chair's On/off switch** is initially controlled by the trainer. Even the reverse switch of the chair may need to be initially controlled by the trainer. Why? The child must experience movement, and control of the chair within a familiar environment. From that experience, the child will develop increased desire, attention, and competence to extend her learning to include management of the chair and the activity.

Unless a **tray** is being used to hold switches/sensors, the tray should be off. No parts of the chair should be "hanging," "loose" or "sticking out." When a chid is learning they should be able to see their entire body and its relationship to the environment.

If a **communication device** is used, it should NOT be mounted, initially, when child is learning to become mobile.

The trainer needs to **know how to STOP** the chair by turning it off, and/or by turning the switch interface off, and by dis-engaging the chair and using "free wheeling."

An **attendant control or "emergency stop"** switch, should NOT be used initially. These are only important when exploring new environments after a child has experience, and the adult needs to be able to manage the chair itself for a long distance (or on a ramp) or cannot be nearby.

The Programming of the Chair required.

Every powered chair should have **its remote programmer** with it. Programming is NOT the venue of the RTS, but rather for the trainers and adults working with the child. With children and first time users, programming will change, and change considerably, back and forth as experience is gained and new environments explored.

Standby and standby modes should not be programmed or used when a child is first learning mobility. These modes are not needed, and constantly interfere with the child's understanding of the consistency of actions of the chair.

No seat functions should be programmed on, nor should **re-set** be programmed. The chair should simply drive, drive slowly, and stop. There should be no menu to follow, no waiting to occur, except for the turning on/off and set up by the trainer.

The **speed** needs to be set very slowly, imitating the speed of an initial stepping toddler. This speed should also be slow enough that the child can hold themselves steady within the chair. However, the chair still needs to perform, so **torque or the power level** needs to be adjusted to allow the chair to move efficiently over carpeting, or door sills.

Speed and turning deceleration and acceleration must be adequately programmed. There are always "delays" built into systems for joysticks, but this causes an unanticipated delay or a drifting of the chair when using switches. When programming for switch access, the reactions should be immediate with no delays. Acceleration and deceleration are only needed when the child can manage increased speeds and multiple environments.

Initial work is indoors. When going outdoors, re-program the chair at that time, and alter it if needed. However, keep the indoor changes consistent.

The Configuration of a Seating System to support access to the environment

Seating for task performance is the the foundation for independent control of the chair. This is seating which does not control tone, nor is it the seating needed for safe, passive transport. This is seating which allows the child to manage her own body, use tone, and allows for pelvic mobility (true stability). This seating is often radically different than the seating needed by the child for the child to be managed. Now, the child is to manage herself.
This may often require the armrests to be removed, the legrests to be removed, the chest supports to be removed, and the seat and back angles may need to be radically altered to support a more upright, yet forward posture. Positions of task performance are critical in independent control. These are positions of pelvic weight bearing, and support. Using seating which has controlled the child, is not going to support the child in controlling herself.

A child should get close to objects, be near to walls, not in the middle of the hall, as mobility is approach, not driving on a road, but rather exploring an environment.

The training session must be short, and as the child's own patterns of independent control are observed, the seating can be increasingly supportive of independent control.

Digital (single switches) control of the chair, particularly with head switches can be considered a starting point, instead of proportional control (joystick) with a hand. Most children who are considered to have complex needs, have difficulty with tone management or motor coordination. A joystick can make a chair move, but controlling it is another completely different scenario. Managing both speed and direction can confuse a young child, or a child who has never experienced mobility. Using digital control, a switch always and only performs one task, and it is always consistent and reliable. This allows a child to quickly and automatically expect the switch to perform a particular way, allowing the child to develop a natural expectation of the activity.

Switch placement must allow immediate success and control. Zero pressure switches are critical here, as the child must only control his range of motion, and not have to coordinate that range with strength. Managing range and strength (or coordination) is already difficult, and can be eliminated with initial training strategies. Success and control, especially control of stop, happens naturally with children when real independence is available. This allows the foundation of safe management of the chair as competence increases with experience.

Attendant control should never be used to manage a chair while a child is learning. Attendant control is for management of the chair when the child is not in the chair. When the child is either headed for trouble, or the adult is anxious about the chair and child's location, the adult trainer needs to turn the chair off, and disengage the chair, move the chair, explain to the child why this activity was stopped. Then, the trainer can start the chair up again, giving the child an experience of time and understanding as to how the difficulty arose. Crashes should not be experienced, the trainer is there to prevent them. Safety is the responsibility of the adult trainer, as the child is learning to "walk." We certainly do not allow toddlers to run out in the street, and we do not expect them to not run out after we tell them once. We remain with toddlers all the time, expecting them to not know rules, to learn to manage their bodies as they learn and experience activity. This same method of support and supervision must occur for powered mobility training.

How the child will learn

Using new equipment which will allow children who have never been mobile in any way, (and certainly not ambulatory), in short, who are very inexperienced with mobility, require completely different training strategies to be successful.

We must teach mobility first, encouraging independent control, before "driving skills" can be taught. We must work within familiar environments for initial mobility, not large parking lots and gymnasiums, or wide hallways, which are completely unfamiliar to the child. We must program and set up the equipment to allow the child to safely explore and learn the use of the equipment in direct control of the environments within which they live and learn.

Instead, we create a "driving environment" as if we were teaching children to drive an automobile, we overly control the situation, constantly demanding the child to listen and obey our commands. This method of learning may be helpful when a machine like a car is being taught to be responsibly managed, but it is certainly not helpful when attempting to teach a child to "walk" and for children with complex needs, "walking" and "mobility" is what they need to learn, not driving.

All children (and adults) learn motor control and postural control through the development of routines. All learning has sensory motor components, and so far, we have paid far too much attention to the motor components, ignoring the sensory integration required to act, and repeat an act. All human beings, not just children, learn by process. This process becomes a routine which is an activity which can be anticipated. The anticipation is the ability to know what will be required to perform the activity, and the knowledge of the beginning, the middle, and the end of the activity. To develop routines, practice which is moderately novel must occur.

Increasing the frequency of the activity, rather than the duration, is how routines develop. Allow the activity to not be managed by an arbitrary longer length of time expecting endurance, but rather allow the activity to be repeated, ended, and eventually expanded.

React to the child's actions, rather than directing the child. If we directed all toddlers as they began to move, they would stop moving. Instead, we naturally support them emotionally. If they stop moving, we presume they intended to stop. So, also, must we support children who are developing experience with powered mobility. React to them, keep them safe, presume every action was intentional. When the chair and its programming and configuration are set up adequately, these actions of the child will be obvious, and under her control. Independence will be evident, although at first, fragile, in that it is not of a long duration, nor always able to be reproduced. However, if the child's actions are not obvious, and appear to be confused, or erratic or inconsistent, then, the chair is inadequately programmed, or the seating has been inadequately conceived.

When will real success and real independence be achieved. It is surprising how children with complex needs must meet expectations higher than ever expected of children with simple needs. Can any child's skills be predicted or anticipated? Can any adult's? No. Only an environment of support and curiosity can be provided to allow a child to demonstrate interest, and competence. Will every child who is in a powered chair be able to manage every unfamiliar environment efficiently? No, but then no child of any age, nor any adult of any age can manage every unfamiliar environment efficiently. However, all of us are able to demonstrate adequate and functional independent control as our personalities and experience and desire allow. Children with complex needs are no different. Some will learn quickly, and learn a lot, some will learn quickly, but only perform in some situations. All will demonstrate independent actions, and control in some environments. We can both tell you that, because it happens with the children we work with, every day, in all situations.

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IC31: The Impact of Lower Extremities on the Posture of Wheelchair Users

Bart A. Van Der Heyden, PT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Analyze three different positions of the lower extremities of hypo- and hyper-tone (tonic) wheelchair users.
2. Describe the impact these different positions of the lower extremities will have on posture and skin integrity.
3. Discuss at least three postural interventions for dealing with common lower extremity positions.

This presentation will focus on assessment techniques and practical seating interventions using an evidence-based approach on users with hypo- and hyper-tonic conditions. Program Faculty:

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IC32: Clinical Applications for Power Wheelchair Platforms

Amy Morgan, PT, ATP
Michelle Kerr, PT, ATP
Hymie Pogir, SVP

This session will explore the clinical implications that should guide the selection of the most appropriate power wheelchair platform for the consumer. There will also be discussion describing how base characteristics can be beneficial or limiting to the consumer. The session will focus on various drive wheel configurations, base options, seating options, and accessories to assist a provider in recommending the most appropriate power wheelchair base based on clinical presentation - not just environmental needs. Time with various wheelchairs will be provided allowing the participants to experience differences among power wheelchair bases and options. The content is supported by research, physics, and real world experience. The discussion will focus on general concepts of various power wheelchair bases and will not be product specific.

Learning Objectively Selecting the Most Appropriate Base

There is no 'one size fits all' power wheelchair because all platforms have their pros and cons. It is important to have a clear understanding of these pros and cons; without this information the process of helping your client select the best power base will be flawed. The outcome could be that your client will experience unnecessary limitations and discomfort and consequently, years of frustration.

Types of Drive-Wheel Configurations:

- Rear-Wheel Drive – The drive wheels (typically the largest wheels) are located in the rear of the chassis. Typically the majority of the weight is distributed more rearward, has largest turning radius, and may offer best tracking and highest speeds.
- Mid-Wheel Drive – The drive wheels (typically the largest wheels) are located in the center of the chassis. Typically the majority of the weight is distributed centrally, has the smallest turning radius, and with six wheels on the ground, is the most stable platform.
- Front-Wheel Drive – The drive wheels (typically the largest wheels) are located in the front of the chassis. Typically the majority of the weight is distributed more forward, has a small turning radius (rear of chair initiates turns), and generally offers the most well rounded platform for indoor and outdoor use.

Participants will gain a greater understanding of the various performance characteristics of each drive wheel configuration - beyond simply variations in turning radius (which is most commonly known.) Understanding that there is no such thing as a "perfect" chair, attendees will be better able to help a client make an educated decision on which type of base would best suit their individual needs.

What's the Difference Anyway?

Are there really significant differences between front-wheel drive, mid-wheel drive, and rear-wheel drive power wheelchairs? How do we decide which drive wheel configuration is best for an individual?

Generally speaking, there are differences between the various drive-wheel configurations that make power wheelchairs perform differently. It is important to know as much information as possible about the environments that the chair needs to navigate. Home layout is one of the most important issues to discuss at a wheelchair evaluation, as the specific layout of the home will guide the rehab team to the most appropriate base. Equally important are any activities outside of the home that the consumer participates in. The power wheelchair should offer reliable mobility to allow a consumer to be active in the community as well as promote independence in the home. School and work related needs should also be addressed to ensure accessible participation.

In addition to environmental considerations, the weight and height of the user are important factors guiding wheelchair base selection; however, more important is how that weight is distributed (body type). Body type plays a critical role in weight distribution and center of gravity. In turn, weight distribution and center of gravity impact a wide range of performance characteristics in the power wheelchair. Specifically, these include stability (safety), traction, efficiency, battery range, etc. There are no clear lines to distinguish when one platform should be chosen over another. Ultimately, the equipment trial is a critical component to the decision making process as each person is unique and should be evaluated individually to determine the most appropriate power wheelchair base. Generally speaking, the mid-wheel drive platform can accommodate the greatest variety of client sizes/shapes because it is least sensitive to weight distribution changes. Pediatric clients generally do very well in front-wheel drive platforms because their shorter seat depths allow them to sit over the drive wheel providing traction and allowing their body to be along the axis of rotation. One of the most difficult body types to seat effectively is a heavy weight user with a short seat depth due to the risk of front loading the casters (RWD and MWD) or resulting in unbalanced weight distribution (FWD) making the chair "tippy."

Case studies will be presented to help attendees know what to look for in both the consumer's environment as well as their body type to make the most appropriate recommendations for the power wheelchair platform. Tips for set up and specific driving techniques will also be presented to allow the consumer to get the most out of the wheelchair platform chosen.

Choosing a Power Mobility Base

The following quotes are from recently published research by Koontz, et al.1 who looked at various distinctions between front, mid and rear-wheel drive configurations:

- "Mid-wheel-drive PWCs required the least space for the 360°- turn in place compared with front-wheel-drive and rear-wheel-drive PWCs (P<.01) but performed equally as well as front-wheel-drive models on all other turning tasks."
- "Even though the front-wheel-drive models were longer and likely had larger swing angles in the rear compared with mid-wheel drive and rear-wheel-drive configurations, users maneuvered these chairs in the least amount of space around the L-turn."
- "Our PWC findings combined suggest that front-wheel-drive and mid-wheel-drive wheelchairs are better than rear-wheel-drive wheelchairs for maneuvering in confined spaces. Maneuverability of front-wheel-drive PWCs may be more intuitive and easier to learn for users who are new to powered mobility or have impaired proprioception because turns can be initiated closer to the bend."
- "The handling of front-wheel-drive PWCs may be more intuitive for some users because the center of rotation is toward the front of wheelchair, enabling the user to initiate a turn at the bend versus having to judge when to begin initiating a turn in order to accommodate a wider front-end swing angle."

In addition to general drive wheel configuration differences, characteristics of the wheelchair should also be assessed:

- Wheels and Casters – Size, Footprint, Tread, Firmness, Resilience
- Lower Extremity Positioning Options – Limitations of front revolving casters
- Seat to Floor (STF) Height – This is important for transfers as well as access under tables, desks, and in/out of vehicles. How does the addition of power seat functions change the STF height?
- Transportability – Has the chair been crash tested? To what standards? Is there a charge for a transit package? Is a docking system available in addition to the 4-point tie-down system?
- Drive Performance – What is the maximum speed? Curb climbing capabilities? Incline? Battery capacity?
- Growth – How much growth (dimensions and weight capacity) is available in the seating system? In the base? How difficult is it to grow the system? Are additional parts needed?
- Aesthetics – It is important to see more of the person than the chair if possible. Can you mix and match backrest and seat width sizes? Looks make a difference, and the consumer should have a choice.
- Ability to Accept Seat Functions – What power seat functions does the base offer? What angles? Can power seating be added in the future if needs arise?
- Electronics/Programming – Does the base offer expandable electronics to accommodate the changing needs of the consumer? Are there built-in environmental control options with the electronics?

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PS4.1: Model for Lifelong Mobility: Increasing Wheelchair Lifecycle in Less Resourced Settings

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Abstract

In the charitable wheelchair (WC) provision model, international organizations collect funds to buy large quantities of WCs which they distribute in less resourced settings (Pearlman et al., 2006). Usually, the WCs are "one size fits all" depot style WCs and distributed with little clinical or technical input (Kim and Mulholland, 1999, WHO, 2011). These depot WCs frequently fall into disrepair, remain unused, or are discarded (Howitt, 2006). The Learning Objective of the 4R Model for Lifelong Mobility was to create a translatable, disenable model to increase the lifecycle of donated WCs. The model creates a WC shop to repair, reuse, recycle and retrofit donated WCs. We piloted tested the feasibility of this model through a series of studies over the course of three years at a Teletón pediatric rehabilitation facility in Mexico (called a Centro de Rehabilitación Infantil Teletón or CRIT). The 4R model involves repairing, reusing, recycling and retrofitting WCs. To test the first three components of the model, a WC exchange program was used in which 25 caregivers who reported having a damaged WC were contacted to donate their WC and receive a replacement. Caregivers were asked questions related to their willingness to use the services of a WC shop. Damaged WCs were evaluated for spare parts to be added to inventory for future repairs. Of the 23 WCs received in the exchange, two were ready to be reused, 17 could be reused with minor maintenance, and 4 were recycled into 38 salvagable parts which required cleaning and/or oiling before made available as spare parts in the inventory. Caregivers expressed a preference to pay for CRIT repair services (84%) or to repair it themselves by purchasing parts from the CRIT (8%); 8% did not have a preference. Caregivers reported willingness to pay on average $6.89 for preventive maintenance, $8.43 for minor repair; $17.17 for major repair. Caregivers' top recommendation for WC improvement was modifications to improve the child's postural support. Training in how to retrofit WCs based on user needs and available technology is necessary to implement this component of the model. The pilot was evaluated based on whether it would be profitable to the clinic and whether WCs being returned would be viable for recycling. Further research is currently being conducted to establish the parameters for the sustainability of the model.

Background

In less resourced settings there is limited access to appropriate assistive technology devices and services (WHO and USAID, 2011, Tan and Ang, 2008). For instance, WCs are needed by about 1% of the world's population (Borg and Khasnabis, 2008) (approximately 65 million people) but estimates from the World Health Organization say that only 5-15% of people with disabilities in the world have access to the appropriate assistive technology they need (WHO, 2010, Borg and Khasnabis, 2008, Kim and Mulholland, 1999). An appropriate WC is defined as one that is safe, durable, able to be maintained locally, appropriate to the environment, and meets the user's needs (Borg and Khasnabis, 2008). For individuals who need a WC as primary means of mobility, an appropriate, well-designed and well-fitted one can be the most important step towards increased participation in society (Borg and Khasnabis, 2008, May-Teerink, 1999, Shore, 2008). Conversely, poorly-fitted WCs can result in the user getting injured and/or abandoning the WC (Batavia et al., 2001, Mukherjee and Samanta, 2005). A variety of efforts have been made to attempt to fulfill the global need for WCs. The charitable model, distribution of donated WCs, and small-scale workshops are the most often described (Pearlman et al., 2006). In the charitable model, organizations (usually international) fundraise to bulk purchase WCs that are then distributed in less resourced settings (Pearlman et al., 2006). These distributions often lack professional, clinical or technical inputs and the majority of the products are "one size fits all" (Kim and Mulholland, 1999, WHO, 2011). Usually no follow-up services or resources are provided to maintain, repair, or replace the WCs if they fail (Pearlman et al., 2008, Mukherjee and Samanta, 2005). Therefore, when a WC fails and requires repairs the user may be injured, his/her function can be reduced or even can be left without any form of mobility (Gaal et al., 1997, McClure et al., 2009, Borg and Khasnabis, 2008). Mexico has a unique example of a pediatric rehabilitation system of 19 rehabilitation centers (CRITs, (Teletón, 2012)) where an expert clinical and technical team is available, but the charitable model of WC provision is still used. A recent study from one CRIT revealed that the donated WCs frequently fall into disrepair (Toro et al., 2012) and, due to the financial challenges of clients' families, the donated WCs in need of repair often remain unused or are discarded. All CRITs have identical service provision models, which make them an ideal organization to collaborate with on piloting research. The goal of the 4R model for Lifelong Mobility project was to examine the feasibility of establishing WC shops at CRITs by conducting a pilot test of a repair depot in the CRIT Guanjuato.

Methods

Participants: caregivers of children who were in the waiting list for a new WC because they had reported to have their current WC in state of disrepair were invited to participate in the pilot. Those who consented to participate were asked to bring their broken WC and exchange it for a new one. IRB approval from all relevant organizations in the US and Mexico were obtained prior to beginning the study.
4R model: consisted of four parts: repair, retrofit, recycle and reuse which are described below.
Repair: any attempt to restore a WC to its original working condition. To support the goal of sustainability, service

centers keep an inventory of recycled and/or new WC parts. Retrofit: donated WCs usually require modifications to accommodate the user's needs. In an attempt to improve the appropriateness of the provided WCs, the retrofit element of the 4R model was proposed. Here the clinicians identify what modifications are necessary and the WC shop staff members make the modifications.

Recycle and reuse: WCs that are returned by families will be recycled and reused. Each WC brought in will be assessed through the WC Assessment Checklist (WAC) (Kamarkar, 2009) evaluation to determine which WCs and WC parts are reusable and which parts should be recycled. The reusable parts were placed into inventory to satisfy repair needs. Inventory management: a database in Microsoft Excel was designed to permit depot staff members to track inventory and record patient maintenance schedules. The database consists of seven sheets: 1) a parts inventory sheet, 2) a WC inventory sheet, 3) a WAC sheet, 4) a ticket sheet (to track the service required and estimate repair time), 5) a receipt sheet (to print and distribute to depot clients), 6) a loan request sheet, 7) and, a maintenance / service agenda. We developed an inventory labeling system (Figure 1) to organize the stock of WCs and parts in a systematic way both in the database and in the WC shop so that stock levels can be easily determined at a glance.

Color	Definition
Red	A broken part/wheelchair that needs to be thrown away
Yellow	A broken part/wheelchair that needs maintenance or repair
Blue	A broken part/wheelchair that has been fixed
Green	A used part/wheelchair that is ready to use
Orange	A new part/wheelchair

Observations: replace both footrests, adjust breaks, and cleaning.	Wheelchair ID# **AWM-40A-MD-16-38**		
Organization	AMW	**Type wheel**	Solid
Model	40A	**Origin**	4R Program
Make	MD	**Color code**	Yellow
Size	16	**Delivery date**	

Figure 1. Color code to classify the stage of the parts/WCs in the inventory (Left). Example of label on a reused WC (Right)

Tools: We developed a tool list, based on literature (Short, 2000, Hotchkiss, 2005) and experts from the Center for Assistive Technology at the University of Pittsburgh, that was necessary to run the WC shop. Tools, machines, materials, and supplies, necessary for assembly and disassembly of WCs included Allen wrenches, wrenches, bench vise, drill press and vise, band saw, among others.
Evaluation measures: the WC Assessment Checklist V2 (WAC) was used for categorizing WCs, based on their physical and working conditions. The checklist is divided into six domains that correspond to a WC frame or part: WC frame and attachments, wheels and casters, postural seating and support, propulsion interface, wheel locks, and user WC interface. Caregivers were asked if they were willing to utilize the Depot and who much were they willing to pay for services. A visual inspection of the WC shop, SWOT analysis and key informant interviews were performed to assess the functioning of the WC shop during the pilot test.

Results

An area of 80 m2 was designated to the WC shop (Figure 2). Twenty-five caregivers participated in the pilot; 23 returned a broken WC. 15 caregivers returned a WC donated from the American WC Mission, six from the WC Foundation, one from the Fundación Bertha O de Osete, and from Lion International. All of the caregivers surveyed expressed a willingness to utilize CRIT depot services, and preferred this option to other repair options available to them. They expressed a preference to pay for CRIT repair services (84%) or to repair it themselves by purchasing parts from the CRIT (8%), yet a few are indifferent to the alternatives offered (8%). None of the caregivers expressed an interest in purchasing parts outside of the CRIT and most reported that doing so was not possible in the area that they lived. For preventative maintenance caregivers expressed a willingness to pay between $0.38 and $30.98, with an average of $6.89; between $1.54 and $23.19 for minor repair with an average of $8.43 and between $1.93 and $38.65 for major repairs with an average of $17.17. For WC repairs that require longer than one day, 96% of respondents reported that they would require a loaner WC; 32% were willing to pay for a loaner chair, and 24% reported that they would not. On average caregivers were willing pay $3.48 per day, with a range of $0.77 to $7.73 for a rental chair. All participants were willing to exchange their unusable WC for a useable one without additional compensation.

Of the 23 WCs we received, two of them were ready to be reused, 17 could be reused with minor maintenance, and four were recycled. We recycled 38 parts from the four WCs that were not salvagable. Parts included footrest, brakes, caster fork, arm support, among others. All of the salvage parts required cleaning before they can be made available as spare parts in the inventory.

Figure 2. WC shop at CRIT Guanajuato

From the SWOT analysis, the largest barriers keeping the WC shop from full operation were the limited staff time dedicated to the shop. The pilot test revealed that is was not possible to completely run the shop at full capacity only using existing staff at the clinic. All staff that interacts with the WC shop need to be trained to coordinate their efforts and integrate their activities. Not all of the spare parts needed were stocked from the reuse/recycle activity. In addition, caregivers will need to be willing to bring wheelchairs into the clinic. This can be a challenge for users that are required to take (inaccessible) public transportation to the clinic.

Discussion

Use of the new WC shop needs to be done among all the CRIT's clients. A part-time staff to work at the WC shop is needed since WCs are usually provided in large numbers (approximately 200 WC at once). Other CRITs will need funds to start the WC shop but could be able to sustain it through payment of the services. Threats to the sustainability of the WC shop may include insufficient stock of spare parts for repair services. The retrofit element of the 4R Model was not implemented during the pilot. To implement a retrofit process in the shop, we suggest training the occupational therapist, physiatrist or physician in charge of the case, physical therapist, and the shop staff how to retrofit WCs based on user needs and available technology. The WHO WC Service Training Package: Basic Level could be used for this purpose (WHO, 2012).

Acknowledgements

This project was funded by the Benter Foundation and undertaken in cooperation with the American WC Mission and Fundación Teletón México. The authors would like to thank Ricardo Guzman and the staff at the CRIT Guanajuato, Mexico site for their assistance during this study.

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PS4.2: Tetraplegia After Spinal Cord Injury: Assistive Technology and the ICF as a Concept: A Case Study

Erika Teixeira, MOT

Introduction

The spinal cord injury is one of the most devastating disabling syndromes that affect humans. When the lesion is located in the cervical spinal cord, causes tetraplegia and when it occurs in the thoracic, lumbar and sacral cause paraplegia. (GREVE & CASTRO, 2001).

The classification of spinal cord injury used by ASIA is based on the classification of Frankel, who drafted the Asia Disability Scale, which specifies the degree of sensory-motor impairment caused by spinal cord injury.

The scale is divided as follows: ASIA A: complete - absence of sensory-motor function in the sacral segments; ASIA B: incomplete - no sensory function below the level of injury, including the sacral dermatomes, but no motor function; ASIA C incomplete - no motor function below the level of injury, including the sacral dermatomes, and most key muscles below the lesion is localized muscle grade less than three; ASIA D: incomplete - no motor function below the level of injury, including the sacral dermatomes, and most key muscles located below the injury level has muscular than three; ASIA E: normal - the sensory and motor functions are normal (ASIA, 1996)

The ICF provides a model of functioning and disability, being used to describe an interactive and evolving process. This is an interaction or complex relationship between state or health condition and contextual factors (environmental and personal factors). There is a dynamic interaction between the areas where the intervention on an element has the potential to modify one or more elements. Domains having equal importance between them and an influence over the other. (WHO, 2003)

Specific Aim

The purpose of this study is to present a clinical case of spinal cord injury (tetraplegia) which the clinical reasoning was based on the philosophical model of the ICF and demonstrate the outcomes of this clinical case.

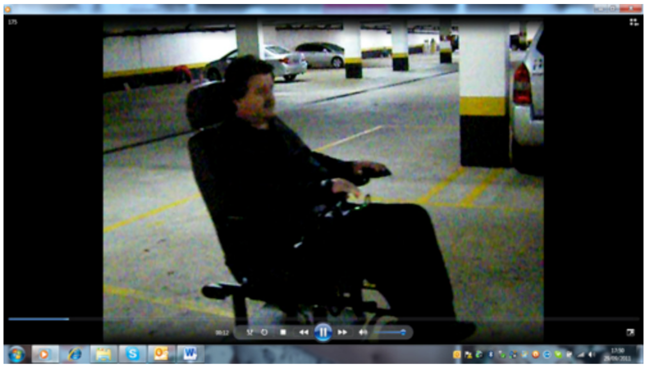
Methods

A patient with Spinal Cord Injury, tetraplegia C3/C4 Asia C, who had been a farmer for the past 55 years. The motor evaluation presented in the assessment in December 2009 showed a some movement on deltoid, biceps and wrist extensor on the right arm. He was enrolled in a rehab program. The OT plan of intervention was: stretching and strengthening exercises, aiming to gain more movement and strengthening the right arm, so he could be a candidate to use a conventional joystickto controla power wheelchairs.

Results

After a year of working with functional stimulation of the right arm, focusing on the necessary movements to control the conventional joystick motorized chair, functional results were obtained. The client was able to use the conventional joystick, and also bought a new car, so the powr wheelchair could be easily transported. Figure 3 shows the patient using the device with its adaptations in order to be able to use a conventional joystick.

Power wheelchair



Discussion

Thinking through the philosophical model of the ICF where work the activity is associated with assistive technology and the functional recover of his professional activity promoted the result of the rehabilitation work of this patient who was a farmer. He uses his wheelchair for his independent mobility, and is able to still work at his farms and also to command his employees.

Conclusion

The scope of the OT, focusing on the body/structure function associated with the aim to return of a previous function, facilitated by the assistive technology, can maximize the capacity and minimize the disability, promoting social participation.

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PS4.3: Manual Wheelchair User Activity Classification in Natural Environments

Alejandra M. Ojeda

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Describe at least three different types of activity monitoring tools for manual wheelchair users.
2. Analyze the percentages of accuracy in classifying four different activities of manual wheelchair users.
3. Describe the potential use of accelerometers in monitoring wheelchair user's activities in their natural environment.

Individuals with spinal cord injury (SCI) rely extensively on their upper limbs for mobility and activities of daily living. While ample reports suggest that pain and injury is highly likely in long-term SCI and overuse is blamed to be the cause, the upper limb activities and the repetitiveness of these activities in the natural environment is unclear. This paper presents a study where a tri-axis accelerometer placed on the upper arm and a Data logger attached to the wheel were used to detect different activities of wheelchair users (e.g., propulsion, being pushed, ADL and rest). These results suggested that accelerometers could be a viable option for monitoring activities of manual wheelchair users in their natural environment.

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PS4.4: Assistive Technology, Occupation, Independence and Poverty

Daniel Marinho Cezar da Cruz, PhD.
Maria Luísa Guillaumon Emmel, PhD.

Introduction

The occupation covers a wide range of doings that occur within a context of time, space, society and culture (KIELHOFNER, 2008). The things that humans do, why and how they do, what they think and feel about themselves, and derive conditions interrelated influences of time, space, society and culture (KIELHOFNER, 2008). When people have a disability the occupations can suffer important alterations on their daily living.

On the other hand, in the world, the issue of disability concerns different countries with respect to shares of rehabilitation of the disabled person. In 2011, the recent World Report on Disability, the World Health Organization (WHO) jointly with the World Bank (WB) reported that about 15% of the world population, i.e.: More than a billion people have some kind of disability and 20% of those who are struggling in their daily lives, and the special needs of persons has been a concern in the face of global growth trend in the coming decades (WHO, 2011).

The extensive report also cites the experiences of several countries, such as Uganda, which found that the assistive technology for mobility has created great opportunities for community involvement and employment as well as for people with disabilities resulting from brain injuries in the United Kingdom, where assistant's personal digital technologies and simple as wall posters were closely associated with independence. Already in Nigeria, equipment for hearing loss showed good results with an increase in function, participation and satisfaction of Nigerians (WHO, 2011).

In November 2011, IBGE (Brazilian Institute of Statistics and Demography) published the preliminary results of the Census of 2010 related to disability. Considering the population identified in 2010 in its entirety with 190 755 799 (100.0%), it was found that 45623910 (23.9%) has at least one of the deficiencies investigated and 145 084 578 (76, 1%), none of these flaws (IBGE, 2010).

Participation in occupations has been the issue of several studies in the world. However, there is a lack of research on the occupational roles of people with physical disabilities and their relationship to issues of independence, purchasing power and technology. Commonly these individuals make use of assistive technology. There is also little research conducted in Brazil to consider the issue of acquisition of technology and its problems peculiar to the Brazilian population.

Aim

The aim was to investigate if there is association between occupational roles, independence, purchasing power, age, time of disability and technology in the lives of people with physical disabilities living in the city of São Carlos, São Paulo, Brazil. For this, we attempted to compare if there was a variation in the number of occupational roles in the three times (past/present/future), according to gender and into two groups (adults and elderly), to describe the performance patterns of occupational roles (absence, continuum, loss, gain), identifying the purchasing power of these subjects using a socio-economic criteria, to identify the level of functional independence of these individuals in the performance of Activities of Daily Living; identify which are assistive technology resources that these individuals have and how did the acquisition of these technologies, usability and abandonment; identify the knowledge about the subject of granting policies of technologies.

Method

From a cross-sectional research, with a convenience sample, we selected 91 subjects, aged from 18 to 93 years, enrolled in Family Health Care Units, with some physical disability. The sample was divided in two groups: adults (n = 34) and elderly (n = 57) to compare the results between them. The instruments of data collection were the Role Checklist, the Modified Barthel Index, the Brazil Economic Classification Criterion and a form developed by the researcher. For data analysis we used a quantitative approach composed by descriptive analysis, ANOVA with repeated measures and Correspondence Analysis.

Results and Discussion

As an outcomes, we found that the subjects showed a considerable repertoire of technologies, mostly acquired with their own funds or donations. Much of these technologies could be granted by the grant program of the Federal Government, however, the list of technologies identified in this study suggests that these individuals also make use, as well as other technologies require not covered by the grant program. It was observed a trend toward reliance on subject, and this trend follows a higher order of dependence to total independence.

For assistive technology, it was observed that the classes with smaller number of technology classes were related to independent and in greater numbers, with some dependency classes.

With regard to the purchasing power it was noted that the classes C1 and D were more associated with less dependence, since the classes B1, B2 and C2 to a moderate dependence and class A2, besides with low frequency and little explanation, coupled with a reliance on more high. It should be noted that although the technology was not directly associated with the independence, the latter was associated with a greater number of occupational roles, which requires a look at the issues of independence, when considering the typology of occupational roles and how this independence moves between roles in the daily life of these subjects.

These findings are consistent with studies that indicate that income is associated with functional impairment in reverse. For example, the IBGE data from demographic and health indicators in Brazil for the year 2009 found that the prevalence rates of functional disability in a sample of elderly poor (up to 1 minimum wage per capita) were smaller those with higher income (IBGE, 2009).

Clinical experience has shown that, in fact, subjects with higher income have a low independence, even when its capacity could reflect greater independence. This aspect has been discussed often based on factors that involve passivity and overprotection of these subjects, the convenience of having a caregiver who performs activities for them as well as easy access to technologies and belief that corrective rehabilitation/restorative bring independence automatically. These findings also allow discuss the issue of capacity, ie what the subject actually is able to do because they can, and the question of performance - what they do in their reality within particular contexts.

In CIF, the description of the concepts of capacity and performance qualifiers contemplates the realization that performance is what the individual does in their usual environment, reflecting the experience of this in a context of real life. The concept of capacity reflects the ability of an individual to perform a task, identifying a probable maximum level of functioning (OPAS/WHO, 2003).

Perhaps, for opposite reasons to those discussed above, in clinical subjects with lower purchasing power, there has been a search for these adapt to their conditions with real independence, since resources are scarce and those guys, meet the needs environmental, adapt to what's available in your reality.

Moreover, household income in minimum wages found no association with any of the variables. However, the descriptive data highlighted that the majority of the sample had family incomes around two minimum wages (30% sample) or three minimum wages (28%). These data were different when compared with data from the National Household Sample Survey (PNAD) for the year 2008, where it was identified that, of registered households, 31.0% had monthly income per capita between ½ and 1 minimum wage . The households with income per capita between 1 and 2 minimum wages accounted for 23.9% of registrations, 19.7% and those with ¼ ½ minimum wage, 12.2% had income of more than 2 minimum wages and 11.2% less than ¼ of the minimum wage of monthly income per capita. The Southern Region of the country was the only one where the largest proportion of registered households had income between 1 and 2 minimum wages (34.8%) (IBGE, 2008).

For France and Pagliuca (2007), the discrepancy of income is not solely responsible for the inequalities in the quality of life of people with disabilities, but also for the diversity of limitations and disabilities. For the authors, other factors such as lack of education, unemployment, crime and violence, difficulties in access to health services can influence this. In short, it can be argued that the lack of association between all variables considered for this study, namely: independence, purchasing power, occupational roles and technologies, reflects, to some extent, the non-linearity between these, given the complexity that involves. In this sense, the thinking on participation in occupational roles and technology mediating such participation requires reflection on the interaction between environmental influences, man and their occupations.

Conclusion

From the data obtained, some implications are done in order to increase actions developed in the health care of people with disabilities and the improvement of public policies for this population. It is believed that this research met the goals it has set itself. Still, it has some limitations. Due to the design of research cover a convenience sample, it is pertinent to note that the results cannot be generalized to people with physical disabilities in the city of São Carlos, but restricted to the sample.

Finally, it is estimated that this research can contribute to collective action among people with disabilities, to improve and increase public policies. Therefore, it is expected that the city of São Carlos, known as the capital of technology, may have this concept with its fullest sense, ie, the technology for everyone.

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IC33: Does My Evaluation Provide Enough Documentation to Get the Product Funded?

Claudia Amortegui, MBA

A therapist's role has become a key in allowing their patients to receive the best product to meet their needs, but also be covered by their funding source. As insurance companies continue to tighten the rules, the question of "what is the funding source(s)" should be one of your initial questions during or prior to a seating evaluation.

Once you know the funding source, the next question is do you know what that means in regards to what can be ordered for your patient? If you are unsure, your provider is going to be your ally in the process. They, as much as you, want to be certain that the insurance claim is paid. In some cases, the provider will first have to deliver the product before any assurance of payment. Exceptions to this are most Medicaid programs, specifically for the under 21 population and some of the commercial insurances. When the therapist is aware of what type of products will be funded for their patient, the process can begin. This information will avoid headaches and delays in delivery of the equipment.

Whether you work with the pediatric, adult or geriatric market, a good rule of thumb tends to be if an order would meet the Medicare coverage criteria, it will likely be paid by all other funding sources; this includes Medicaid coverage which has tightened-up in most states for all beneficiaries.

As you look to evaluate if you are providing the appropriate documentation, it is suggested that you look at your specific area of expertise and/or your client population. This will allow you to assess your current evaluation forms/letters. Another key in your assessment is whether your providers are continuously asking for additional information.

Some basics that always should be provided, but at times seemed to be missed are: Full patient name, date of birth, height and weight, primary diagnosis, secondary diagnosis/conditions, date of the evaluation, and if this equipment is for a first time user or replacement of other equipment (even if going from a manual wheelchair to power).

Then it comes down to the details. Most funding sources are looking for clinical documentation for all the different options/accessories that are being ordered and billed. This does not necessarily have to line by line for each item, but the information needs to be within your notes/evaluation. In most cases, this is not something that the provider can complete and just have you sign. If they do, the funding sources may ask for "proof" within any clinical notes (from the therapist or the physician).

Something else to keep in mind is the fact that the majority of funding sources will look at a patient's current medical need, not necessarily what they will "likely" need in the future. This does not mean that they will not pay for medically necessary modifications down the road (or possibly even new equipment). When providing documentation for patients with progressive conditions, it is strongly suggested that you state the specific individuals situation, not a general statement about any person with the listed diagnosis (i.e. ALS). If a patient is progressing, discuss how fast, how slow, and what it is affecting. Remember, you know your patient, but the funding source only knows them by a number and the paper provided to them. It is your job to tell the story and draw the picture of your patient with your words.

Some funding sources also require an ATP, who is employed by the provider, to be involved with the order. Keep in mind, this does not mean they just sign-off on documents and never are part of the equipment selection process. This requirement was created to protect the patient, to help ensure that they are working with a person knowledgeable in seating and positioning. Effective March 1st, 2013 there are new Medicare rules requiring ATPs for ultra-lightweight wheelchairs (K0005).

If you are provided with funding information that does not appear to make sense, always verify the data. Providers are given a lot of information and at times, without meaning to, the information is not interpreted correctly. The rumors of certain products not being funded tend to start by those providers that are having difficulties in being reimbursed for the specific item; therefore the immediate conclusion is the item is not covered. Ask questions and ask others. You do not need to know all the funding codes; you just need to be involved in the process. Many funding sources will have time limitations on when documentation must be received and how quickly product needs to be delivered. Without a therapists support, these timelines will be missed and the whole process will have to start over again.

IC34: Dosing for Pediatric Standing Programs: A Systematic Review

Ginny Paleg, DScPT, MPT, PT

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Describe the levels of evidence.
2. Standing programs are evidence-based.
3. Determine appropriate lengths for standing programs based on their stated goals.

There is a current lack of direct evidence-based recommendations for effective dosing of supported standing programs, despite widespread clinical usage. We will provide clinical recommendations based on the existing evidence with authors' opinions as well as other considerations to assist with clinical decision making.

In a systematic review of the pediatric and adult supported-standing literature, the evidence provided moderate support for a positive impact on bone mineral density, range of motion, spasticity and bowel function, offering little to no support for other outcomes. Here, we reviewed and focused on the dosing of supported standing programs based on reported pediatric-specific outcomes as a follow up to our original systematic review.

Using the International Classification of Functioning, Disability, and Health (ICF) framework (Child and Youth version) as the professional vernacular, we recommended standing programs 5-7 days/week for up to 90 minutes/day to positively affect the following:

- Bone mineral density (60-90 minutes/day) based on Levels of Evidence
- Hip stability (60 minutes/day) in 30-60 degrees of total bilateral hip abduction based on Levels of -Evidence
- Range of motion of hip, knee, and ankle (45-60 minutes/ day) based on Level of Evidence
- Spasticity (30-45 minutes/day) based on Level of Evidence

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IC35: Stop, Look and Listen!

Andrina J. Sabet, PT, ATP
Lauren Rosen, PT, MPT, MSMS, ATP

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Identify key components of a child's history that can influence individualized mobility equipment goals.
2. Identify how to implement equipment trial in the wheelchair assessment process for the pediatric client to optimize equipment selection for his or her unique needs.
3. Identify support in current literature for mobility equipment to support pediatric functional outcomes.

All children, disabled or not, are unique individuals with different needs. It is the interaction of the child and their environment that results in development. Equipment has the opportunity to facilitate this interaction; however, when incorrectly prescribed, the equipment itself can be a barrier to access, participation and socialization. When evaluating children for equipment, the evaluation team should enter the evaluation without preconceived notions about what the child needs based on diagnosis alone.

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IC36: Know, Go, Grow - Pediatric Mobility Bases and Designs for Independent Mobility

Kay E. Koch, OTR/L,ATP

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Identify four features to consider when selecting pediatric manual mobility.
2. Site one research finding used to support the need for independent mobility in pediatrics.
3. Understand the path from evaluation to delivery of mobility equipment.

This beginner session, designed for clinicians, will review and discuss considerations for both dependent and independent manual mobility.

Movement is considered fundamental to a child's cognitive and psychological development. Children who are dependent in their mobility at early ages may be more passive and lack confidence and motivation than their counterparts who use technology to facilitate movement in their environment. Research on "learned" helplessness supports the need to transition children from dependent mobility systems when possible to increase opportunities for independent exploration.

The two overarching considerations covered in this session are 1) issues to consider when deciding the appropriate time to transition from a dependent mobility base to a manually propelled system and 2) how to ensure that the mobility base is comprised of the needed features.

There are many similar considerations including seating,growth, transfers, maximum weight capacity, and transportation options that need to be considered with dependent mobility bases and manual wheelchairs. The short and long term goals for mobility must be included.

The path from evaluation to delivery will be addressed. The importance of a mat assessment, trial equipment and environmental issues are part of this path. Multiple issues will be discussed on how the clinician and other team members play a role in this process even after the initial mobility and/or assistive technology evaluation.

IC37: Thinking Outside of the Box "If I cannot find it, I will make it"

Yunn-Yi Pau-Lee, PT, MA, ATP
Ed Lipositz, ATP, CRTS

Introduction

This course is appropriate for clinicians as well as durable equipment suppliers who frequently work with clients with multiple physical disabilities. The clinician, often as a part of a team, evaluates the client to determine their specific needs. The DME supplier will be asked to offer input as to available equipment options that can match the stated needs of the client. If there is nothing available in the market to meet the determined goals, our client's special needs will not be addressed, resulting in a compromised or less functional outcome. This is a circumstance when the DME supplier may be asked to fabricate custom parts in order to accommodate the client's special physical and medical needs. The presenters, a clinician and a supplier have been working together for more than 12 years, and during this time have designed and fabricated many custom modifications to seating systems. Some of the designs that will be discussed include unconventional modifications to Molded Seating Systems, special lower extremity support accommodations, and creative tray adaptations. This is a course to share our experience and encourage all participants to "Think Outside of the Box"!

If Want It, You Must Ask

It wasn't long ago that we couldn't order a pelvic positioning belt with a 1" buckle and webbing, or a 19" wide Whitmyer headrest, how about the i2i headrest from Stealth Products. Thanks to the pioneering clinicians who have driven the industry to where we are today these products are no longer "Special Order" items; these products are now available in the regular catalogs. There are many more examples, i.e. female (slim line) style chest harnesses, structured harnesses, the pivoting seat from Easy Stand, and "Spica" footrest hanger clamps.

To Mold or Not to Mold? This is the Question.........

For many of our clients, nothing can compare to a properly molded custom seating system, there is no substitute, it can change a client's life....... But there are inherent drawbacks to all molded seating systems. In order to function properly the mold must be intimate, and the static nature of custom molded seating systems allows little or no adjustability. Living in New Jersey with temperatures varying from 100 degrees on a hot summer day to sub-zero in the winter, some flexibility in the seating system is routinely critical in order to gain acceptance of our recommendations from family members and caregivers. Accommodation for differing weight clothing is a real issue that must be dealt with for a number of families. The use of a mechanical lift system is another issue that cannot be discounted when recommending a custom molded seating system. Installing and removing the sling from under the client, especially when deep contours are required can be very challenging for many caregivers, sometimes making the transfers neither safe nor effective.
Do removable laterals sound like a solution? We have been fabricating removable laterals for a number of years, and they can work well!

A $700 AAC mounted on a $1,000 mount?

Yes, the child needs to talk and he/she needs to have their augmentative device with them at all time. Can you justify a $1,000 mount for a $700 device? Should you add 10 lbs of weight to a child's ultra light wheelchair so she can have her device with her? Will the wheelchair tip sideways when the AAC is mounted to the sideframe of the chair? We have solutions for these questions; modify the UESS (tray). We have secured the AAC to the tray surface. The weight added to the chair is minimal, and if the stability of the tray is questionable, there are ways to stabilize the tray itself.

Windswept Deformity – it is not only outside the box, it is outside the wheelchair footprint

What happens when the accommodation of a client's windswept deformity doesn't mesh with the environment? This client is transported on a school bus and must be able to access his home environment; our preferred seated posture creates an overall footprint that is too wide for his school bus lift and the doors in his home. We've created an alternate mounting system using the manufacturer's standard swing-away footrest hangers, allowing us to place the footplate and hanger tubing in almost any position. The "outboard" hanger can be removed and replaced with one that fits the environment. This strategy "temporarily" compromises our preferred seated posture, but allows environmental access.

The posture says "Contracture Platform", but we need removable hangers

The contracture platform was designed to accommodate clients with orthopedic concerns, but what if we need that lower extremity positioning and the hangers need to be removable? Occasionally we need to seat a client with very narrow hips, and excessive abduction...... do you really want to do a 22" wide wheelchair for a client with a 14" hip width? We've utilized a version of our "Windswept Deformity" modification described above to allow us to address these clients. We mount the hanger support tubes internally; this allows us to position the footplates wherever they need to be while avoiding any interference with the hanger tubing and the outside of the lower leg. The hangers can be removed to allow for stand pivot transfers and to enhance access for caregivers during transfers. We've also done this modification for a client that was expected to have hip surgery in the near future, if all goes well we can simply reconfigure the hanger support tubes into the seat rail.

It’s a severe scoliosis, a body jacket has not been tolerated, and she’s too young for spinal stabilization

We’ve done the mold, she’s in a tilt-in space wheelchair frame, we’ve utilized several additional supplemental support attempts, including a “Y’ Style harness, padded upper extremity support surface (tray), and an i2i head and neck support system, the intervention is still not acceptable. Now what? After some experimenting in the clinic, we re-molded………….. in a fixed lateral tilt. We mounted the new system to the client’s wheelchair with the corresponding fixed lateral tilt; we’ve achieved an acceptable outcome. We’ve bought time, the client is tolerating the new system, we have no excessive pressure issues, and caregivers are able to manage transfers. The key was to mold in the laterally tilted position, and incorporate all available supplemental support accessories.

Thoughts from the supplier’s perspective

1) For the Supplier

- You are a valuable member of the team, as such, contribute. Communicate with the consumer, family, clinicians, everyone involved in the assessment, your office staff, and the funding sources. You will be the one thread of continuity that can tie the process together.
- Listen, it’s the most valuable part of communication. Routinely everyone involved in the assessment process can present different outcome targets and priorities; they are all valid and relevant. Keep an open mind, accommodating multiple desires doesn’t always mean something has to be compromised. Because something hasn’t been done before, doesn’t mean it can’t be done, we must continue to push the envelope. When you’ve really exhausted all possibilities, choose the acceptable compromise and move forward. Our target is excellence, not perfection, paralysis by analysis is not an acceptable option for our clients.
- If you’re fortunate enough to have a custom shop, treat your shop technicians and the owner of your company with respect. With the advent of national corporations in the arena of complex rehab, the number of true “Custom Shops” has shrunk dramatically. Unless efficiently run, it is virtually impossible from a cost standpoint, to maintain a custom shop. If you reap the benefits of a custom shop, you carry the responsibilities of maximizing efficiencies and minimizing waste. Communicating clearly with your clinicians and shop technicians will minimizes time consuming and costly re-dos.
- Get to know a contact in the “Customs Department” of manufacturers that you routinely work with, and get an understanding of what their capabilities are. With fewer in-house custom shops, suppliers can utilize manufacturers’ customs departments for a wide array of unique applications. Verbal, written, drawings, and photo communication is relatively simple and can be enormously helpful.

2) For the Clinician

- In recent years, the nature of funding has changed dramatically, because something was approved in the past, or just because it is available, does not mean it will automatically be approved or be available for placement today. Coding and corresponding fee schedules will routinely drive available product choices. As we often say, Blue Cross is no longer Blue Cross, we must be aware of the unique benefit structure of each client’s insurance plan/plans. Arrange for insurance screens for all of your clients prior to them meeting with a supplier. You must know if there are network relationships that must be navigated and if there are any basic benefit clauses that may be relevant.
- Arrange a system for managing the paperwork maze. Equipment will not be funded without detailed and specific documentation, and different funding sources and suppliers may require differing documentation. As difficult as it is to find the time to provide the correct documentation the first time, how on earth are you going to find the time to do it a second time? Communicate with the supplier or their office staff as to exactly what paperwork will be required for each equipment request. It will save time and frustration in the long run.

Summary

Many of the recent innovations in our industry are the result of creative clinicians and suppliers pushing the envelope of what is available, and demanding more. Each one of us has encountered equipment challenges, and come up with ways of dealing with the issue. We need to share our ideas and continue to “Think Outside of the Box”.

I, Yunn-Yi Pau-Lee do not have an affiliation with an equipment, medical device or communications organization.

I, Ed Lipositz do have an affiliation with an equipment/medical device organization (equipment vendor); however, I cannot identify any conflict of interest in respect to this presentation.

IC38: Let's Get the Show on the Road!
Integrating Life Support with Mobility Systems

Mala Aaronson, OTR/L, CRTS, NSM
Lois Brown, MPT, ATP/SMS

In our daily practice as providers of complex seating and mobility, we may encounter individuals with complex medical needs, who depend on several life sustaining devices. Many of these people are homebound because their mobility systems do not support the transportation of all of these devices.

Medically complex children, in particular, also have large care teams that may include up to seven to ten members. Each specialist will have his or her own agenda regarding the accommodation of a variety of medical devices, items to support educational tools, components to provide comfort and support, function in various environments and, of course, aesthetics.

Typically, for a child with complex medical issues and life support devices to venture outside the home and integrate into a school program, the care team will consist of the parent(s) or guardian(s), the primary care physician or pediatrician, and often, several other medical specialists, including Physiatrist, Neurologist and Orthopedist as well as the nursing staff to maintain the guidelines and care that is prescribed by each of these physicians. The clinical team may consist of a Physical Therapist, Occupational Therapist, Speech and Language pathologist, and often Vision and Hearing professionals, as well as the Special needs educator.

The expertise of each of these team members plays an integral part in building a mobility device which will allow the child to safely and comfortably venture out into new environments and participate in educational and social activities. It is our challenge and responsibility as Rehab Technology Professionals to accommodate as many of these aspects into the mobility product to provide the child with the greatest access to a full and enhanced life. We must take the time to acquire a complete list of all of the components that are necessary to meet the medical, support, comfort and access needs of each child, and then to prioritize and balance all necessary components within the mobility system.

In the case studies that will be presented, it was determined that each of these children required the following components; Mechanical ventilator and battery, oxygen tank, suctioning machine, feeding pump, pulse oxymeter, and augmentative communication device, positioned at eye level.

Before we can consider the accommodation of all of these components, we must design a seating system that provides the child with the necessary postural support which will maintain comfort for long term seated tolerance, and positioning to optimize breathing capacity and digestion, as well as upper body and head position to optimize interaction with his or her environment.

Generally, tilt in space, and/or reclining seat functions that incorporate several positioning components will be necessary. Of course, especially when providing wheelchairs to small young children, there exists limited available space underneath the wheelchair which can be used to accommodate all of these items, and the weight distribution of the equipment cannot alter the stability of the wheelchair, or obstruct access to the body. The varying tilted or reclined positions of the seating system throughout the day, as well as overall access into all areas of the desired environments, including transportation vehicles, must all be considered.

Ideally, when possible, it is best when ordering a manual or powered wheelchair, to utilize as many of the device supports that are offered with, and have been designed for that particular model. In recent years, we have experienced the advantage of more and more children able to be sustained on notebook style ventilators, which tend to take up less space, and often have the batteries incorporated into the vents themselves. The orientation of the ventilator must allow for adequate air intake, and the controls and displays at the front panel should not be obstructed. Wheelchair manufacturers and aftermarket companies frequently offer ventilator trays and support frames which mount to the back of the wheelchair, and may free up more real estate underneath the seat to accommodate batteries, suction machines, and daily bags filled with diapers, changes of clothing, braces, etc.

It is difficult to find receptacles offered by the manufacturers for oxygen tanks other that the "C" or "D" type cylinder style tanks. These tanks can be quite heavy, and, are generally designed to mount to the back of the chair. These tanks must be properly secured, but provision should be made for their quick and easy interchange. Due to the angle changing nature of these frames, the weight of the tanks must be balanced with other devices further forward under the frame. When possible, accommodating a smaller oxygen tank on a tray mounted under the seat is optimal.

To balance the weight of the ventilator and oxygen tank, other items such as the suction machine and accessory batteries, which need to be accessed less frequently, may be supported under the front of the seat, on a well secured tray. Feeding pumps and tubing generally need to be hung on IV poles above the body for the liquid nutrition to drain freely. Although several manufacturers provide angle adjustable IV poles to accommodate for changing seat angles, they have been found to present an unnecessary extra challenge when mounting to the frame, as the weight of the pump or bag itself, as long as it hangs freely, ensures that it remains perpendicular to the ground, regardless of the pole angle.

Most augmentative communication systems have brackets that are dedicated to their installation onto most of the popular wheelchair frames. So, it is important, when ordering a chair for a child who will be utilizing such a system, to note the specific chair model in order to obtain the correct bracket. Occasionally, even with the dedicated bracket, in the midst of so many other devices competing for space on the frame, creativity with custom modifications to that bracket for mounting solutions may be necessary.

Just when you think you have accommodated all of the necessary components into the system, there is bound to be one more request from a team member! It has been a challenge to be creative with some alternative components, with the assistance of the team, to mount accessories underneath the footplate assembly, as will be illustrated in the case studies presented. This provides for some extra space, and serves as further balance in weight for all of the devices in the back of the chair.

In conclusion, it is a complex challenge to accommodate several life sustaining devices into a small mobility system. All goals, including comfortable supportive seating, multi-environmental accessibility, balanced center of gravity, and transportation safety all need to be met. When the team of professionals work together in a creative, cooperative way, the outcome of inclusion is invaluable to the fragile child.

IC39: “Freedom” - An Overview of Functional & Therapeutic Benefits of Dynamic Seating

Jay Doherty, OTR, ATP/SMS

When performing a seating and positioning evaluation with an individual who has high or low tone the challenges the seating team faces are significant. We need to think about the stability the person needs but also the functional movement that a particular individual needs in order to complete an activity from their wheeled mobility device. This challenge can be very difficult to achieve.

Teams often place an individual in the position that they feel best manages the persons tone. This position is often static and although it limits tones affect on the person’s position, it often limits their functional movement as well. These individuals often do require repositioning throughout the day due to the fact that their extensor tone will eventually slide their pelvis forward on the seat cushion at least a slight amount. This position with the pelvis forward on the seat cushion will cause an undesired posterior pelvic tilt to occur, and the individual will remain in a posterior pelvic tilt until someone repositions them in the seating system.

We have to keep in mind that as human beings we need to move, on average a person shifts their weight approximately 30 times in an hour when in the seated position(1). In addition, ergonomics practice tells us the only effective way to endure a seated posture for an extended period of time and to be productive and functional in that posture is to change positions constantly (2). We must keep in mind that although the individuals we work with do not have the same control over their movements as the majority of population, they do still have the need to move on a regular basis to remain comfortable, well positioned and healthy. So we need to consider how to provide these individuals with the ability to move and yet remain in a healthful well positioned sitting position.

People with high tone are often over stabilized with seating components which in some cases eliminate a significant portion of the person’s movement. High extensor tone can thrust people out of their normal seated posture. Asymmetrical tone results in postures that deviate from the midline (3). Allowing these individuals to move and assisting them in returning to a neutral posture is what we need to achieve. If they don’t return to their neutral posture or if they are allowed to move in an asymmetrical manner and remain there then long term orthopedic issues may become a concern over time.

We need to think about all the activities worked on in therapy with the individual on a mat. The therapist has them work on sitting balance, reaching activities and then coming back to a neutral starting position. The individual working on these activities often doesn’t have another opportunity to move their body in and out of these therapeutic positions during the week because they are placed back into a static seating system that prevents these types of movement from occurring. This leaves this individual at a significant disadvantage because this limits this muscle development and movement to therapy times only. We need to consider that the seating system can be a therapeutic device by letting the individual move in and out of healthful positions throughout the day.

It is at this point that evaluating what movements can be accommodated and what movements are counterproductive needs to occur. In doing this, we need to look at the individual and assess how much movement should be allowed. This may require a dynamic seating system or it may just require using seating components to only allow movement that is functional to occur.

There are many different dynamic systems on the market and they all function differently. So the team needs to explore which system is best for the individual they are working with. A couple of these dynamic systems are: The Kids Up seating system, Miller’s Dynamic backrest and footrests, The Sung Seat Panda X, The PDG Bentley, and the Dégagé Dynamic Rocker Back. These systems all allow for a dynamic seated position but limit the extent of the movement that is allowed.

There are not a huge number of studies available at this time relevant to identifying the benefits that dynamic seating provides. The following are benefits noted by a clinical study and by parents of children using dynamic seating.

Clinical study benefits of a dynamic seating system include:

- Increased range of motion at hips and knees (4)
- Tone management (4)
- Increased levels of daily function (4)

In clinical case studies, some parents of children have reported:

- Greater peer interaction
- Improved head and upper body control
- Increased sitting tolerance
- Expanded verbal skills
- Reduction in laxative use
- The ability to remain properly positioned

Based on the information provided in this course, the intent is to make therapists and providers working with individuals who have high and low tone to think about how the individual they are working with could benefit from the additional movement that a dynamic seating system can provide.

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I, Jay Doherty, have an affiliation (financial or otherwise) with a medical equipment manufacturer (Pride Mobility Products Corp) during the past three calendar years. I am a full time employee of Pride Mobility Products Corporation as the Clinical Education Manager.

IC40: Power Assist: Fundamentals, Evidence of Efficiency, and Applications for Success.

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Traditional and common forms of mobility include manual and power wheelchairs. There are times when an individual still desires manual mobility but complications of self-propelling begin making manual propulsion difficult which often reduces participation in meaningful activities. Other times an individual may be a marginal manual propeller but their environment doesn't support the use of powered mobility. A simple solution is the power activated power assist wheels (PAPAWs'). There have been several publications that will be shared that support the use of this equipment. In order for an individual to have the greatest success in propulsion, several characteristics of the chair should be reviewed. These include wheelchair set up, propulsion style, and programming options. Without ensuring that the three areas have been thoroughly addressed, the user's success may be compromised. This session will provide a review of the fundamentals of self-propelling, wheelchair set up as well as review programing options. Case studies will be used to illustrate how these techniques can be applied and hands on demonstration will occur. By the end of the session each participant will have a better understanding of the application of the option for power activated power assist wheels.

Learning Objective

1. Understand how wheelchair set up can affect efficient manual wheelchair propulsion.
2. power assist wheels.
3. Explain two or more propulsion styles.
4. Identify one or more change to increase wheel access for self-propelling.

Supportive literature

1. Ding, D.,A. Souza, et al. (2008). "A preliminary study of push rim-activated power-assist wheelchairs among individuals with tetraplegia." American Journal of Physical Medicine and Rehabilitation". 87 (10):821-9.
   PAPAW can be a viable mobility option for individuals with tetraplegia, which can provide independent mobility especially for outdoor activities. A user's preference, lifestyle, physical conditions, transportation issues, and environmental factors should be considered in prescribing such a device.
2. Iacobbi, P.R., Levy, C.E., et al (2010). Wheelchair users' perceptions of and experiences with power assist wheels." American Journal of Physical Medicine and Rehabilitation. Mar, 89 (3): 225-34.
   Primary outcomes showed that most participants perceived positive experiences including access to new and different activities. Most people felt the PAPAW's provided more independence and social opportunities.
3. Nash,M.S., D. Koppens, et al. (2008) "Power assisted wheels ease energy costs and perceptual responses to wheelchair propulsion in persons with shoulder pain and spinal cord injury." Archives of Physical Medicine and rehabilitation 89 (11): 2080-5.
   Use of PAPAW's by persons with paraplegia and tetraplegia having shoulder pain significantly lowers energy cost responses and perceived exertion compared with manual wheelchair propulsion while significantly increasing the distance propelled.

Assessment considerations

1. **Clinical interview**
   a. What is the problem; background; history?
   b. What are you hoping to achieve?
   c. Understand the client's entire routine from beginning of day to end of day

2. **Quantitative assessment**
   a. What tools and measurement devices are used?
   b. Have you ruled out everything before jumping to power?

3. **Outcomes**
   a. How do we use this information and what do we do with it?

Wheelchair Set Up

1. **Manual wheelchair set up resources:**
   a. Clinical Practice Guidelines for Preservation of Upper Limb Functioning: www.pva.org

2. **Ergonomic Control System (ECS) -**
   a. This is a hand held controller that gives Power Assist Wheels expanded features and capabilities.
   b. The ECS will give the user the ability to turn the wheels on and off without having to lean over and access the on/off switch located on the center of the wheel hub. It will give the user the ability to see the battery level of the wheels on the ECS instead of on the hub.
   c. It will give the wheels the ability to go into a "hill holder" or "grade-aid" antiroll mode.
   d. It will give the wheels two separate speed modes.
   e. It will give the user the ability to program the wheels.

Power Assist Set-up

Parameter LOW level	Action	Parameter HIGH Level
3	Startup Delayed Responds	6
4	Power Level Adjustment	7
5	Follow-up time for low *How long the motor runs*	8

Wheelchair Skills Training

1. Wheelchair Skills Test; Kirby http://www.wheelchairskillsprogram.ca
   a. Wheelchair Skills Program
   b. Wheelchair Skills Test

Training and Power assist

1. Initially we do not want to have the client to have high power and long roll time.
2. We want to keep less sensitivity in the beginning so the chair doesn't respond too abruptly and takes off too quick.
3. Start time and sensitivity; short start time; high sensitivity; the chair will respond a lot quicker.
4. If client does not have good trunk stability/good seating it will displace their center of gravity and prevent them for maintaining good trunk control.

Initial settings to get started

1. Adding delay to the start time to 1 -1.2 seconds (4-5 bars)
2. Keeping the power setting relatively low to start at 40-50 % (2-3 bars)
3. Making sure the follow up time is short and start at 1 second (2 bars)
4. Now you can make incremental adjustments to anyone of the parameters to make most opportunity to what the PAPAW can do for the client.

Summary Points

- An ECS should be considered similar to expandable electronics for a power wheelchair.
- Allows independent access of turning power wheels on and has the option to use a ECS controller. It allows user to have independent access to the power hub.
- The anti-roll back mode is necessary for any user who has to navigate uneven terrain, slopes or steep grades in their daily lives.
- The two speed modes give an individual choice to respond to changes in daily need by alternating speed.
- The ability to be programmable provides individualized ability for the user to modify needs as day to day or month to month changes in a user's function due to their particular disability.

PS5.1: The Design and Efficacy of a Maximally Pressure and Tone-Reducing Wheelchair

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Candy Pleasance, OTA

Introduction

Clinical settings routinely use pressure-reducing surfaces on beds for patients at high risk for skin breakdown, with the use of these surfaces acknowledged as best practice and the products employed ever-more sophisticated. However, there continues to be a lack comparable seating and positioning systems. The benefits of sitting as opposed to lying in bed are well-known, and include enhanced respiratory function, increased alertness, engagement in communicative behaviours, etc. In many facilities, patients at high risk for skin breakdown are transferred from state-of-the-art mattresses to little better than 'geri chairs.' Even when supplemented with standard cushions, these wheelchairs do little to prevent further damage to fragile skin due to poor fit and placement.

The problem: University Health Network's Toronto Western Hospital (TWH), provides a wide range of services, ranging from primary care for those residing in the local community, to specialized tertiary and quaternary care services for persons presenting with an array of complex neurological conditions. Although well-supplied with a large and varied inventory of wheelchairs and seating and positioning devices, the Hospital lacked a wheelchair that could meet the needs of those with severe issues related to skin integrity. Many of these patients are admitted to the General Internal Medicine and General Surgery Units from the local community, and present with a host of co-morbidities. TWH has made significant investments to ensure a range of pressure-reducing surfaces and mattresses are available for patients throughout the facility and the interprofessional Wound Care Team is viewed as integral to the provision of care. However, despite ready access to dozens of pressure-reducing wheelchair cushions, there was no wheelchair that could match the overall level of pressure-reduction provided by the specialized mattress surfaces.

Opportunity knocks

An unexpected capital grant was allocated for purchase of a specialized wheelchair. In seeking to determine the area of greatest need, a review of patient populations was undertaken, and it was decided that a lack of a maximally pressure-reducing wheelchair was undermining the provision of the highest level of care for persons with significant skin integrity issues. Although patients had access to full surface pressure reducing mattress surfaces, the lack of similar seating systems prevented clinicians from mobilizing these patients from bed to chair.

The initial design: A decision was made to design the wheelchair around an Invacare Horizon Tilt Recline (HTR) base. The HTR wheelchair has been used extensively at TWH, with a high degree of acceptance and success by both allied health and nursing. Rugged, and highly adjustable, it meets the needs of patients presenting with many different seating and positioning issues. This versatility would allow the occupational therapists to configure the new wheelchair meet the specific needs of a wide range of patients with ease – yet not frustrate the nurses who are primarily responsible for daily bed to wheelchair transfers.

The HTR's seat and back upholstery was removed and replaced with ABS bases, to provide a solid planar surface upon which to place pressure-reducing materials. Custom-sized Action Gel Pads were covered with a breathable fabric and Velcro'ed over the ABS bases. Providing additional pressure reduction, with an easy-to-clean, low maintenance surface, Action Gel was also Velcro'ed over all other surfaces likely to come into contact with the patient – the headrest, the lateral supports, the arm rests, the pelvic positioning strap and buckle, the calf pads and foot plates.

High-profile Star Dynamic Air Flow Cushions were placed on top of the Action Gel Pads on the seat and back surfaces to provide maximal pressure-reduction. The combination of the Star and Action Gel surfaces maximized the potential pressure-reduction, with the Action Gel also serving to prevent damage caused by undetected deflation of the Star Cushions. A removable, washable cover was made for each Action Gel Pad or Star Cushion to aid in cleaning and foster infection control.

Individual components including covers were labelled with waterproof ink to assist staff in correctly reassembling the chair after cleaning.

Implementation

A sign-out sheet was created to allow the wheelchair's use to be tracked and to develop a profile of the 'average' user. However, Occupational Therapists sought to use the wheelchair before the form was even printed and the wheelchair was marked for inventory control purposes. The new wheelchair had to be removed from use within weeks of delivery, as the weight of the Action Gel Pad covering the back and calf pads caused the Velcro adhesive to fail. A harness system was devised, with no other issues arising due to component failure.

Results

Anecdotally, occupational therapists noted that patients who were transferred to the wheelchair were more alert, and engaged in a greater range of communicative behaviours. One patient who had been bed-bound and non-responsive began to scan her environment when placed in the wheelchair, and indicated gesturally that she did not want to be transferred back to bed after her initial hour in the chair – eventually sitting up for 3 hours. Because only one pressure-reducing wheelchair was available for the entire Hospital, there was frequently a waiting list, with occupational therapists negotiating for its use. It had not been anticipated that patients and families would be loath to discontinue use of the wheelchair, even when no longer clinically necessary. However, in one case, a patient used the wheelchair for approximately 4 months, with the family forcefully advocating for its continuation because of the perceived beneficial effects of the wheelchair.

Unexpected findings

The wheelchair was created as an alternative to bed for those with significant issues related to skin integrity, and its value was essentially presumed to be related to respiration, communication, swallowing, and increasing level of alertness. Clinical experience demonstrated that the anticipated benefits were largely realized, and wheelchair was robust enough to withstand the rigors of a large, urban hospital. However, it was not anticipated that the wheelchair would also reduce neurological muscle tone in patients who had experienced acquired brain injuries, related to cerebral vascular accident, tumour resection, anoxia, etc.

Case Study – Why not?

The wheelchair was trialled with a patient who had undergone a brain tumour resection and developed severe, bilateral lower extremity clonus elicited by pressure over the plantar surfaces of the feet. This clonus exacerbated the patient's generalized extensor tone, making it almost impossible to sit comfortably or safely. After trying many different wheelchairs with multiple adjustments, a decision was made to try the pressure-reducing wheelchair – almost in desperation. It was hoped that the lack of sharp, hard or otherwise 'stimulating' surfaces in contact with the patient would limit the effects of generalized tone. Nursing staff was advised to mechanically lift the patient into the wheelchair in full tilt, with approximately 25 degrees of recline. The patient was to 'relax' into the wheelchair after transfer, as the stimulation of the mechanical lift inevitably increased the patient's extensor tone. After 15 to 30 minutes, the patient's tone reduced significantly, and the wheelchair could gradually be returned to a position that was more upright, facilitating orientation and communicative behaviours. The large 24-inch back wheels allowed for a smooth ride, minimizing tone-eliciting bumps, and the ease with which the chair repositioned allowed staff members and family to readily increase the amount to tilt if periodic tone-reduction was required. By finding a way to facilitate tone-reduction in a seated position, the patient was gradually able to respond to the interventions of her therapy team. Previously, severe extensor tone and clonus hindered the efforts to progress activity tolerance, balance, participation in communicative behaviours and safe swallowing. Through the use of the pressure-reducing wheelchair, anti-spasticity medication and a variety of therapy techniques, the patient's tone became less of an impediment, and global improvement was noted, with the patient transferring to an active rehabilitation facility.

Why did the pressure-relief wheelchair help manage neurological tone?: A review of the literature provided the answer. Herman and Lange (1999) outlined sixteen factors that contribute to the inhibition of neurological tone or spasticity when designing a therapeutic seating and mobility system, particularly in the critical and acute care environments. "The term therapeutic seating is used to distinguish seating that is merely comfortable and supportive, from that which is used as a tool to apply a specific intended stimulus for a corrective purpose, such as normalizing alignment or reducing abnormal tone. In this respect, the seating equipment is an orthosis that serves as an extension of the therapist's hands applying a treatment." (Herman & Lange, 1999, p. 105)

In reviewing the design of the pressure-relief wheelchair, it was determined that fifteen of the sixteen factors that contribute to the inhibition of neurological tone were present, with the exception of the provision of dynamic positioning.

Spasticity inhibiting factors (Herman & Lange, 1999, pp.107-113)	**Corresponding features in the pressure-relief seating and mobility system**
1. optimum posture	tilt and recline
2. neurophysiological techniques	easy adjustability
3. primitive postural reflexes	rigid frame; 24 inch back wheels; maximally pressure-reducing surfaces (air and gel cushions)
4. abnormal movement patterns	tilt and recline; easy adjustability; pelvic positioning strap
5. proximal stability	pelvic positioning strap
6. pelvic stabilization	pelvic positioning strap
7. lower extremity position	tilt and recline; easy adjustability
8. upper trunk and head position	tilt and recline; removable/adjustable headrest
9. upper extremity position	removable lap tray
10. orientation in space	tilt and recline; easy adjustability
11. dynamic equipment	nil
12. sensory and visual disturbance	tilt and recline; maximally pressure-reducing surfaces (air and gel cushions); low nap upholstery; easy adjustability
13. emotional and cognitive stress	
14. physical work demand	
15. discomfort and pain	
16. skin irritation	

Conclusion

The pressure-reducing wheelchair has become a well-utilized seating and positioning option for occupational therapists at Toronto Western Hospital. With the inclusion of a heavy-duty harness to accommodate the weight of the Action Gel Pads, the wheelchair has stood up to the rigors of an acute care setting with multiple care providers for over a decade. The wheelchair can be disassembled for cleaning purposes, and all covers can be safely cleaned in the washer and dryer with medically-approved sterilizing agents. Three other other maximally pressure and tone-reducing wheelchair have been fabricated, including one bariatric version, based on the wheelchair's proven and sustained clinical success in multiple patient populations.

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PS5.2: The Use of Custom Bed Positioning for People with Severe Physical Disabilities

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Deborah Poirier, COTA/L, ATP, SMS

Learning Objective

1. Identify three benefits of custom therapeutic positioning beyond the wheelchair.
2. Identify three indications for custom bed positioning for individuals with severe physical deformities.
3. Identify three benefits of custom bed positioning for individual with severe physical deformities.

Introduction

Individuals with severe physical disabilities benefit from customized positioning supports beyond their wheelchairs to reduce health risks, to help promote optimal health, and improve functional abilities. Custom therapeutic positioning is used to promote improvement in mobility, skin integrity, respiratory capacity, eating, swallowing, digestion, elimination, and overall comfort.

The Tennessee Department of Intellectual and Developmental Disabilities supports three assistive technology clinics (ATCs), one in each region of the state, that specialize in customized seating and therapeutic positioning for individuals who have significant physical deformities. Originally, each of these clinics was part of a large state residential institution serving children and adults with intellectual disabilities. Many of these individuals had congenital deformities and/or acquired significant physical deformities over the years due to a lack of proper positioning to counteract abnormal reflexes and muscle tone.

As the state began a concerted effort to downsize and gradually close large institutions by helping people move to homes in the community, the ATCs were gradually transformed into community based clinics. They provide custom seating and positioning services to individuals throughout the state who have intellectual and developmental disabilities as well as significant physical deformities.

In addition to a clinic for evaluation by an occupational or physical therapist, each location houses a custom fabrication shop. Over the past fifteen years, the clinics and shops have evaluated, simulated, designed and fabricated custom molded wheelchair seating systems and custom fabricated alternative positioning equipment including sidelyers, prone on forearms, quadruped on forearms, and bed positioning.

Experiences

Years of consistent implementation of graduated custom therapeutic positioning with individuals resulted in gradual reduction in the severity of their physical deformities, leading to improved wheelchair seating and functional abilities. In addition, alternating between a wheelchair and various custom positions throughout the day resulted in very few instances of skin breakdown. However, after several years of concentrating primarily on supporting people's positioning needs throughout the day, it was recognized that not implementing custom positioning at night was compromising physical improvements made during the day. Moreover, certain individuals who had diagnoses of gastroesophageal reflux disease, aspiration pneumonia and who received enteral nutrition experienced numerous hospitalizations for aspiration pneumonia in spite of raising the heads of their beds on blocks and attempting to provide supports using standard pillows and wedges.

Various attempts were made to provide more consistent positioning in bed throughout the night to reduce reflux, aspiration, and further deformities, while promoting safe lifting practices for caregivers. Ultimately these attempts led to the implementation of custom inclined supine bed positioning systems. These included custom molded seating systems mounted on mobile inclined bases which replaced the individuals' regular beds. The bases are fabricated at an angle greater than 30 degrees and can go as high as 45 degrees. In addition to the custom molded seat and back, these systems incorporate custom head, arm, and leg/foot supports. They are covered in a water resistant material, are easily disassembled for cleaning, and are fabricated in such a way that caregivers can easily reassemble them appropriately.

Implementation of these custom bed positioners resulted in several important benefits. There was a marked reduction in the incidence of aspiration pneumonia and subsequent hospitalizations for those experiencing frequent problems with aspiration. Individuals' sleep improved at night due to being able to sleep in a system that provided full distribution of pressure relief so repositioning throughout the night was no longer necessary. Finally, custom therapeutic positioning at night reinforced positive gains made during the day leading to improved wheelchair seating and overall functional abilities.

A retrospective case study of several individuals who obtained custom incline supine bed positioners with the intent of reducing incidences of aspiration pneumonia is in process. This presentation will highlight the data obtained thus far from this review, share clinical decision making processes leading to modifications and customization of equipment, and provide pictures of inclined custom supine bed positioners as well as other custom bed positioning systems.

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PS5.3: Helping Wheelchair Users be more pro-active in their seating system

Wayne Hanson
Andy Foster, OTR/L, ATP

When able-bodied people are seated for a period of time, they will cycle through a series of movements to help relieve pressure, respond to the environment, prevent discomfort and keep busy enough to feed the neurotransmitter connection between the brain and the body. When the decision is made to make the transition from sitting to standing, they rock forward into an anterior position and transfer weight from their seat to their feet.

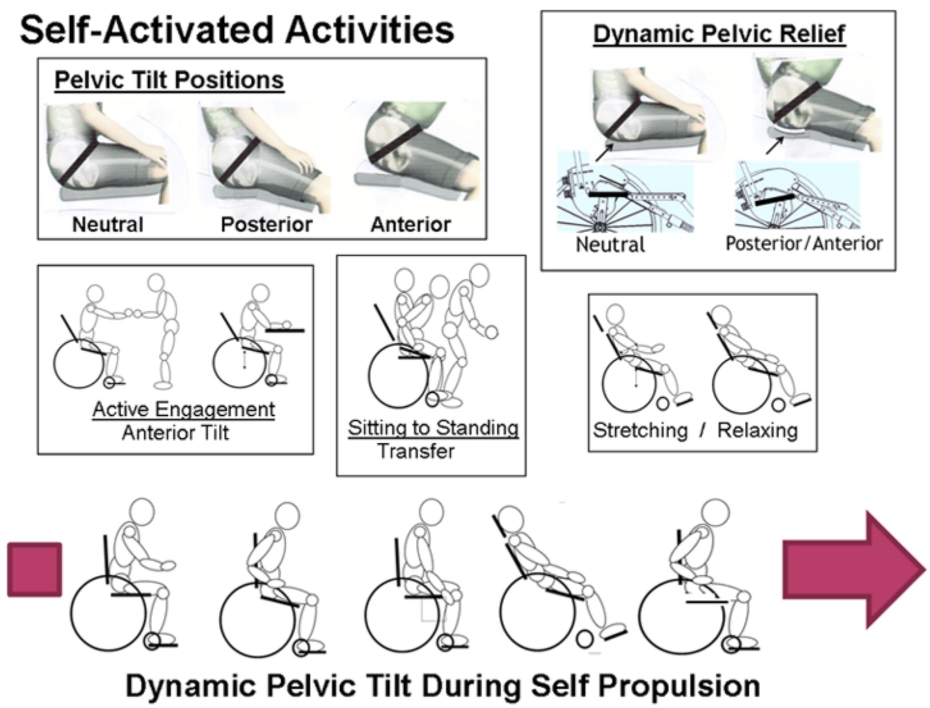
When people with disabilities are unable to adjust their position or change the seating environment while seated, they are often dependent on the caregiver to intervene to provide therapeutic support, prevent problems from occurring and maintain comfort. Sometimes it is difficult for the caregiver to understand and translate just how to fix the problem, when the person cannot or will not tell them what the problem is. A person with disabilities seldom knows what they need therapeutically, but they do know when they feel pain, discomfort, are bored, if they would like to get your attention or if they want you to leave them alone.

Many studies have been done to determine the best pelvic position or positions for optimum functionality. An upright or slightly anterior position promotes active function. When the individual wants to relax, it is beneficial to be able to stretch back into a more open hip angle. It can be challenging to provide enough postural support to enable the Wheelchair User to experience freedom of movement, so they can cycle from one functional position to the next, when they want to. Once, they have the postural support they need, they can adjust their position to provide comfort, relieve pressure and position themselves to play an active role in their environment.

When a Wheelchair User can shift from the anterior to the neutral to the posterior pelvic position all by themselves, it can empower them to take a more active role in their environment. When they are able to lean forward and look you straight in the eye, it can help them communicate more clearly how you can help them and how they can help you.

Learning Objective

1. We will measure the following self-initiated activities.
2. We will compare the functional range of anterior and posterior movement with and without the support of modified Hip Grips from Body Point Designs.
3. We will measure the level of function and pressure relief provided from self initiated posterior and anterior pelvic tilt using the REACH Chair from Xplore Mobility. These studies will be done while the Wheelchair User is seated and during self propulsion.
4. We will document a variety of methods that have been use to get direct feedback from the wheelchair user to help in providing the proper amount of seat back curvature and resistance tension in their dynamic seating system.



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PS5.4: Seating and Positioning for Children with Rett Syndrome

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Carrie Strine, OTR/L

Rett syndrome (RS) is a developmental disorder resulting from a genetic mutation at the time of conception. Diagnosis of RS is confirmed by a blood test. Children are generally diagnosed around 18-24 months of age, due to a slowing of development. RS affects mostly females. Diagnostic criteria include: normal prenatal history, normal head circumference at birth with a deceleration of head growth, stereotypic hand movements such as wringing and clapping. RS was thought to be a degenerative disease, however now, it is noted to have areas of deterioration. While girls lose gross motor skills, their cognitive skills can continue to improve.
RS progression is characterized in stages:

- Stage I begins between 6 and 18 months of age. Children begin to show a delay in gross motor skills, a lack of attention to their environment and sometimes will start with stereotypical hand movements.
- Stage 2 begins from 1-4 years and can last from weeks to months. This stage is characterized by the consistency of stereotypic hand movements, initially presenting as hand mouthing and clapping. Characteristic breath irregularities are present with breath holding and hyperventilation in evidence. Gait is unsteady with jerky, uncoordinated movements.
- Stage 3 is 2-10 years of age. This is generally a stable period. Improvements are seen in behavior, greater interest in surroundings and improved attention. Apraxia, gross motor difficulties and seizures may be more pronounced during this stage. Walking becomes harder and girls may rely more on a wheelchair for mobility.
- Stage 4 is characterized by an even greater decline in mobility due to an increased prominence of weakness throughout, spasticity and scoliosis. Families note cognition, communication and hand skills become consistent.

Improvements are noted in emotional bonding and eye gaze. Orthopedic considerations for the female with RS include osteopenia, muscle tightness, hip dislocation, scoliosis, and upper extremity contractures. Osteopenia is common in girls with RS. Girls should have a dexa scan at 7 years old. Fractures occur easily and girls should be monitored closely, as many girls have a high pain tolerance, and fractures are not noted initially. Bracing is another option to help to control muscle contractures. UE bracing is considered to maintain functional use of the upper extremities. Hand splints and wrist splints are common but success is individual. Ankle foot orthoses are utilized to prevent planovalgus deformity and maintain feet in good alignment for sitting posture, ambulation and transfers. Thoraco-Lumbo-Sacral Orthoses (TLSO) are often recommended as there is a high prevalence of scoliosis in RS. Common orthopedic surgeries include gastrocnemius lengthening, osteotomy or muscle lengthening for hip instability and spinal fusion for scoliosis.
Communication is a challenging area for girls with RS and their families. Children with RS lack the oral motor control or the brain connections needed for speech. Research has shown that speech centers in the brain remain intact. Families report girls' receptive language to be exponentially better than their expressive language. Communication ability varies widely with girls with RS. Augmentative communication evaluations are encouraged to explore different options for output, include eye gaze technology which has been found to be successful for many children.
There are many considerations for seating systems when evaluating a girl with RS for a mobility system. Families generally want to choose a stroller system for ease of transport. Physicians who work with children with RS want a seating system with an upright back and lateral supports to support lateral trunk lean and spinal curvature. Another reason for upright back is to assist with a safe, functional swallow. Aspiration and difficulty with swallowing are common in the RS population. A seating system should help to control excessive hip adduction due to the risk for hip dislocation. The wheelchair needs to be able to accommodate mounting options for a communication device. An interesting facet of the stereotypic hand movements noted in RS is that when one hand is stabilized, the alternate hand has an improvement in volitional control. This should be used as a therapeutic aide, not a restraint. A tray provides both structure for proprioceptive feedback, upper body support and access to materials.
Growth considerations in a seating system need to be considered. Girls with RS have generally been small and maintain their slight frame over time. Typically girls with RS have poor weight gain due to the increased time it takes to eat due to difficulty chewing and swallowing, reflux and aspiration. G-tubes and high fat diets are being prescribed more commonly to combat malnutrition. Building in growth for length and width is recommended also. Keep in mind the potential for use of a TLSO in the future.
The progression of seating and mobility needs for a girl with RS present very similar. The following timelines show this progression among three different patients.

Patient A

Birth	2 yrs old	4 yrs old	8 yrs old	10 yrs old	12 yrs old
2000 Early milestones were on target. sat at 6 months Began walking at around 14 months;	**2002** DX: RS Hypotonia; Became less interested in environment - secondary to limitation in mobility. Ambulatory but uses stroller for community secondary to seizures	**2004** Near drowning event diminished her cognitive and communication skills; Ambulatory but uses stroller for community secondary to seizures	**2008** Ambulating for shorter and shorter distances – spending more time in squatted position and on hands and knees; using stroller most of the time No scoliosis present	**2010** No longer a functional ambulator – stroller for all mobility; Increase in seizure activity; Increase in respiratory dysrhythmias	**2012** Scoliosis and increased hypotonia; Tilt in space wheelchair with solid I-back, laterals, solid contour seat, other positioning components

Patient B

Birth	2 yrs old	4 yrs old	8 yrs old	10 yrs old	12 yrs old
2000 Early milestones were on target; 4-pt crawl at 9 months of age; Began walking at around 11 months;	**2002** DX: RS Hypotonic; Became less interested in environment - secondary to limitation in mobility; Ambulatory but uses stroller secondary to seizures	**2004** Mild ambulatory regression at age of 3 but it returned; Slightly decreased tone but no problems with transitions between sitting and standing	**2008** Ambulating for short distances; seizures remain incompletely controlled – creating the need for stroller based mobility for long distances or community	**2010** Bilateral lower extremity pain; unable to weight bear; LE issues resolved; regained ambulation but declined	**2012** Remains ambulatory but relies on stroller based system for all long distance mobility; Continued bilateral hip/lower extremity pain; Thoracolumbar kyphosis

Patient C

Birth	2 yrs old	4 yrs old	6 yrs old	10 yrs old	12 yrs old	14 yrs old
1998 Early milestones were on target;	**2000** Begain walking about 14 months; Uses a stroller for long distance mobility	**2002** Ambulator but uses stroller for long distance mobility; Behavior issues developed-	**2004** Mild ambulatory regression; Continues to use stroller Seizure occurring more frequently;	**2008** Scoliosis developing – measured 29° Imbalance in gait Manual wheelchair	**2010** Scoliosis measures 48° - Spinal fusion occurred; Wheelchair seating and positioning	**2012** Continues to use wheelchair with pressure cushion and contoured backrest

There are many factors that contribute to the severity of symptoms in a child with Rett Syndrome. Orthopaedic issues, seizure activities, respiratory dysrhytmia's, etc… all contribute to the length of time a child ambulates before needing a mobility system. Likewise, the progression of scoliosis can vary, and thus delaying the need for aggressive seating and positioning within a mobility system.

Health care providers are learning more and more about the intricacies and the patients we treat who have RS. Life expectancies of children diagnosed with RS live well into their 40's. As their postural needs change, the technology within seating and mobility remain constant.

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IC41: Functional Positioning for Preschoolers and Beyond: Complex Conditions

Melissa Tally PT, MPT, ATP
Kihmberly Wilmer, MOT, OTR/L

Learning Objective

Participants will be introduced to a unique interdisciplinary model of therapy for children with complex needs. Participants will define key functional positioning options from infancy to early school years and beyond that can help to promote active movement and participation and impact cognitive function. The Presenters will look to re-define the opportunities available for using adaptive equipment for functional participation and "active" learning. Participants will identify key strategies for equipment selection for functional activities.

The Perlman Center: An Interdisciplinary model of intervention

The Perlman Center provides a unique and holistic approach to integrated therapies that supports all areas of development to address the complex needs of children with cerebral palsy and other physical disabilities. The Perlman Integrated Therapy model was developed for the young child, from infancy to kindergarten age, to be more responsive to the critical learning and developmental needs of this age group. This program provides small groups of children with frequent and extended contact with an interdisciplinary team of therapists and educators.

This model of intervention provides an interdisciplinary approach to treatment within a natural environment for learning for children: a school environment. Occupational, Physical and Speech Therapists work alongside an early childhood specialist to promote learning regardless of a child's complex condition. One area of concentration for children with complex needs is positioning, especially positioning the child for participation in functional activities. This goes beyond the child's wheelchair and encompasses a wide range of positioning equipment that will provide support and facilitate access without constraint.

For early intervention, within a small group model, the care team provides one-on-one therapy combined with focused parental education. Upon first observation, the Integrated Therapy Program for the preschool years has the look and feel of a preschool environment with children actively engaged in activities and interacting with peers. The primary focus for the team is on functional outcomes of participation and learning. Communication, emergent literacy, physical access, mobility, strengthening and other means of advanced technology are used in innovative ways by all members of the team. This allows the therapists the ability to see how children apply newly developing skills, identify target areas for treatment and stay connected to the family. (1)

The Team Rules: Understanding the Role of the Team

The family is the center of the team and is supported by the therapists, developmental specialist and social workers. This is truly an integrated model of care. The interdisciplinary model at the Perlman Center includes all of the therapists, developmental specialist and social workers in the same program, the same room, working together. Each therapist understands and supports the treatment goals of the other disciplines and the whole team supports the functional goals of each child. (1)

Mobility Impacts Cognition

Active movement impacts cognitive function. "Independent mobility in early childhood has been associated with the development of various cognitive and psychosocial skills. However, children with physical disabilities are not always able to move independently and may be at risk for delays in these areas. Early provision of powered mobility can offer young children an opportunity for independent mobility" (2). Providing equipment that is supportive and allows for spontaneous movement is key to the overall scope of adaptive equipment and intervention for children with complex needs.

Piaget viewed action and active engagement as instrumental processes in the cognitive and intellectual development of children (3). Children with moderate to severe neurologic and developmental disabilities are often unable to explore or manipulate their natural environments independently. This can significantly affect active movement and development. As an example, "Crawling changes the way weight is borne on the palm of your hand and impacts handwriting and fine motor skills later on" (4).

Equipment for mobility, positioning, weight bearing and strengthening all contribute to the child's ability to interact and participate in their environment. Equipment can often be the tool to allow those with physical barriers to move and explore their environment, offering developmentally appropriate experiences and opportunities for learning.

Positioning For Function

Children with multiple physical challenges require a range of equipment that will promote optimal physical control to participate in all of their environments including home, school and their community. Additionally, positioning can be used not only for functional control but to assist with movement and exploration, strengthening, proprioception and sensory stimulation, promote vision and visual processing and ultimately enhance learning and development despite the level of involvement.

A variety of adaptive equipment and specific case examples will be discussed including approaches for integrating equipment in all environments. Photos and video will be used to demonstrate the importance of adaptive equipment to allow opportunities that encourage active movement and learning.

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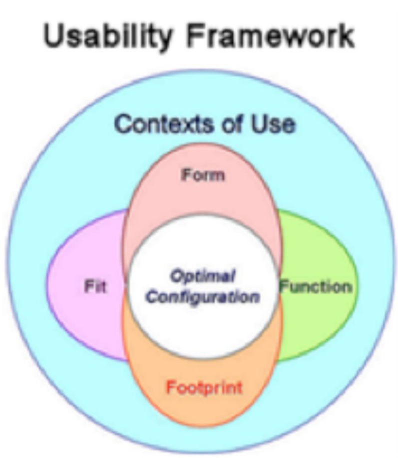
IC42: A Programmatic and Pragmatic Approach to Providing Power Mobility for People with ALS

Steven J. Mitchell, OTR/L, ATP

Amyotrophic Lateral Sclerosis (ALS) is a fatal neurological condition characterized by a progressive loss of motor neurons in the spinal cord, brainstem, and motor cortex. The majority of people diagnosed with ALS will die from respiratory complications within 3-5 years, however, 20% will survive for more than five years. Many of these individuals will require power mobility.

Research suggests that those who served in the military are more-likely to develop ALS than the general population. In 2008, the Department of Veterans Affairs ruled that veterans diagnosed with ALS should be given a "presumption of service connection"--making most eligible to receive their health care and mobility equipment through the VA. Shortly after this ruling, the Spinal Cord Injury & Disorders (SCI/D) Service at the Cleveland VA established a Multidisciplinary ALS Clinic to provide coordinated specialty care to this population using a team approach. As part of the new clinic, SCI/D therapists assumed responsibility for prescribing their custom mobility equipment.

As one of 24 VA Regional SCI Centers, these therapists had experience prescribing complex custom mobility equipment through a "clinician-driven" model of service delivery. In this model, therapists not only determine the functional needs of the user, they obtain product specifications and oversee any pre-fitting configuration that is required. A usability framework guides the equipment selection and specification process to ensure that the right product is provided in the optimal configuration to meet the needs of the user in their expected environments of use.



The advent of the new ALS clinic brought uncertainty about how the collective needs of this group might be different from veterans having other forms of SCI/D. Based on conventional wisdom, it seemed reasonable to assume the following:

1. Most ALS powerchairs would be equipped with power tilt, recline, elevating seats, and power elevating legrests. (1)(2)

2. At some point, a significant number would need to be reconfigured with alternative driving systems or attendant controls to accommodate changes in function.

3. Since respiratory insufficiency is a major consequence of ALS, a significant number of these powerchairs would be equipped to carry ventilators on board.

To determine if these perceptions were accurate, a retrospective review was performed which looked at the configurations of ALS powerchairs prescribed through the new clinic between March of 2010 and November of 2012.

It is important to note that this data was collected solely to identify possible trends in mobility equipment prescription to veterans followed in the clinic. The 33 month period that was reviewed is also less than the 3-5 year life expectancy of people diagnosed with ALS. Therefore, while the results may raise questions for future examination, they are anecdotal in nature and should be treated accordingly.

ALS Powerchairs Prescribed by SCI/D

Number of New ALS Powerchairs	31
Power Seating Functions:	
- Tilt Only	1
- Tilt-Elevate	15
- Tilt-Recline	0
- Tilt-Recline-Elevate	15
Alternative Driving Systems	4
Attendant Controls	11
Equipped to Carry a Ventilator	1

Key Findings

Every ALS powerchair prescribed by SCI/D therapists during this period was equipped with power tilt. While nearly 97% had a power elevating seat, only 48% were equipped with power recline.

None of the powerchairs prescribed during this period had to be retrofitted with an alternative driving system due to a change in function.

Attendant controls were prescribed on 35% of ALS powerchairs. If chairs with alternative driving systems are excluded, less than 25% had attendant controls.

Three ALS powerchairs prescribed during this period were reclaimed and reissued to other veterans after the original recipient had passed away.

Discussion

To our surprise, none of the assumptions about our ALS powerchairs has proven to be accurate. Although this was unexpected, much of what we found could be explained by the "functional presentations" of ALS that emerged during this period. They were also consistent with the usability framework and service delivery model used during the equipment provision process.

Functional Presentations and "Go To" Configurations

All of the veterans referred from the clinic had been diagnosed with sporadic ("classical") ALS. Most experienced their initial onset of symptoms as weakness in an extremity, while a smaller proportion experienced bulbar symptoms first.

For the vast majority of these veterans, a joystick with expandable electronics was sufficient for them to be independent with powered mobility. Although many users required additional intervention as they lost anti-gravity movement, those who could initially use a joystick were able to stay with a joystick as long as they had their powerchair.

Over time, "go to" configurations of specific models emerged that were likely to meet the needs of most veterans. These configurations provided the potential to be reconfigured to accommodate future needs while providing optimal usability in the present. Supportive seating, good upper extremity positioning, joystick mounting hardware that allowed precise placement, efficient switch access, and advanced programming capability were characteristics common to all "go to" configurations.

When custom mobility equipment is prescribed based on functional needs, providing the most-usable powerchair for the individual may not necessarily be equipped with all power seating functions. Many people with ALS will lose function rapidly and may not have the time to complete extensive home modifications. Approximately half of our powerchairs were midwheel drive models equipped with tilt/elevate systems, custom backs, and center mount legrests. In our experience, with the proper pre-fitting configuration, this configuration can minimize accessibility issues while still providing excellent comfort and ease of use. At the time this was written, no model equipped with power recline could provide a comparable footprint or better maneuverability and still fit an average-sized adult male.

Of course, power recline was determined to be beneficial for enough users that it appeared on almost half of our ALS powerchairs.

Challenging Configurations

A significant minority of veterans required more-challenging configurations to meet their needs. Case in point were the four powerchairs equipped with alternative driving systems. All were for veterans who's functional presentation was consistent with the "flail arm" variant of ALS. (3) Each user had minimal upper extremity function, but could stand and ambulate for years before they were assessed for power mobility. All received similar configurations that included: a proximity head array, arm troughs equipped with elbow stops, and remotely-located mode switches that could be activated with a lower extremity due to marginal strength in their neck muscles.

For veterans who lack the upper extremity strength, head control, or oral motor function to use a traditional alternative driving system, "hybrid" alternative driving systems may hold promise. Hybrid systems combine characteristics of more than one system to reallocate key functions to other points of control. Use of the lateral proximity switches on a head array to steer while using a sip-n-puff or two way toggle switch for directional control are examples of hybrid systems. Such hybrid systems can be less-complicated (and less expensive) than they may initially seem.

Another challenge is to successfully interface respiratory equipment with the powerchair. This is especially true if all power seating functions, a ventilator, and supplemental oxygen are required. When the Multidisciplinary ALS Clinic was started in 2010, no such configuration was available. Fortunately, that is no longer the case.

Non Invasive Positive Pressure Ventilation (NIPPV) has been found to prolong survival rates with ALS, and is used much more-frequently than invasive ventilation. There have been few efforts to interface this type of equipment so that it can be transported and powered by the powerchair.

This is but one of the emerging technical challenges that will need to be overcome on future ALS powerchairs. Hopefully, collaborative efforts between health care professionals, seating professionals, and manufacturers will allow future ALS powerchairs to meet the needs of this population even better than the powerchairs being used today.

Sharing our knowledge collectively will be critical to these efforts. For this reason, many of the images used in this presentation can be found at the following link:

https://picasaweb.google.com/112492121025286352145/ISS2013IC42ALSPresentation

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Alt Text for Images

Image 1
The image illustrates interrelationship of 4 key aspects of wheelchair specification--Form, Fit, Function, and Footprint. They are depicted as four ellipses on top of a circle representing the contexts in which the chair will be used. The area where the ellipses overlap represents the ideal balance of these areas which is referred to by the author as the "Optimal Configuration" of a mobility product for a given individual.

Image 2
Image of a joystick configuration typical of those found on our ALS powerchairs. Key characteristics include precise joystick placement relative to the armrest, a foam build up for the handle, and efficient switch access.

Image 3
A go to configuration of a midwheel drive model equipped with tilt/elevate system, custom back, and center mount legrests. Overall length after pre-fitting configuration is only 41.5".

Image 4
The flail arm variant of ALS can devastate upper extremity strength while preserving lower extremity function. A proximity head array, arm troughs equipped with elbow stops, and remotely-located mode switches were common to this configuration.

Image 5
Hybrid systems combine characteristics of more than one system to reallocate key functions to other points of control. This image shows the lateral proximity switches of a head array used in combination with a sip-n-puff switch.

Image 6
An example of a custom ventilator tray/O2 holder option which could meets the needs of those who require all power seating functions, a ventilator, and supplemental oxygen.

IC43: Wheeled Mobility Prescription: From Infancy Through Adolescence and Beyond

Elaine Antoniuk, PT
Beth Ott, PT

Introduction

The wheeled mobility needs of children with motor disabilities change with their cognitive, physical, and social development. When prescribing appropriate mobility equipment, these developmental issues need to be considered in the context of child's home, school, and community environments. As well as independent mobility options, many children will need an attendant mobility option for longer distances and for environments where independent mobility is impractical or difficult. In this paper, the wheeled mobility issues for 3 different age ranges are discussed and further subdivided into options to consider for independent wheeled mobility and attendant wheeled mobility.

Wheeled mobility prescription for infants, toddlers and preschool children

Children who are typically developing begin to crawl around 8 months of age and to walk around one year. Research has shown that this transition from the pre-locomotor to the locomotor stage has a profound impact on perceptual, emotional and personality development.1 Conversely, limiting independent movement has a negative impact on the development of children and can lead to passive, dependent behaviour.2

For infants with disabilities, there is now a wide array of mobility equipment available. Initially, it may be sufficient to use commercial baby strollers, but by 12-18 months of age, many parents and therapists find that this no longer meets the mobility needs of the toddler.

Independent wheeled mobility options for the young child

There are some difficulties in providing efficient manual mobility to young children. Wheelchairs for young children need to be able to grow. Frames designed to accommodate growth tend to be heavy relative to the weight of the child, and sometimes it is not possible to optimally position the wheel for effective self-propulsion. Some paediatric wheelchairs can be set up with the large wheels in the front to improve self-propulsion.

Weight of the chair relative to the weight of the young child may affect independent manual mobility. Researchers found that speed, distance, and exertion were significantly different for young girls when using ultra-light rigid chairs compared to their lightweight folding chairs.3 Ultra-lightweight paediatric chairs that weigh under 10lbs are available but unfortunately the frames don't grow. Rigid frame grow-able wheelchairs tend to range from 12-14lbs.

With younger children, parents may not be emotionally ready to consider a power wheelchair for their child. Clinicians may also be resistant for fear that the child will no longer be interested in improving or maintaining ambulation. Research shows no decline in motor abilities following introduction of a power wheelchair4 and no difference in motor development between children using power mobility and controls.5

Some researchers have suggested that the independence engendered by use of power mobility can increase motivation to use existing skills more effectively.6 Power mobility has also been shown to have a positive impact on receptive language development and level of independence as well as functional mobility skills in young children.5 For those children who have severe physical impairments that will impede them from becoming independent manual wheelchair users, introduction to a power wheelchair at a young age is recommended.7

Attendant wheeled mobility options for the young child

For many reasons, parents of infants and toddlers often prefer a stroller to a paediatric wheelchair.8 There are light weight, basic strollers that are easy to fold and have larger wheels, but they only provide basic postural support. Special needs strollers are available with highly adjustable seating systems that can also be transferred to a high-low base for use indoors. These high-low bases are often very useful in daycare, preschool or kindergarten as well as in the home. Unfortunately, the high-low bases are quite heavy and are not easily transported.

Often, a stroller will not be compatible or age-appropriate in kindergarten. Funding sources may only fund a new mobility base every 3-5 years. Therefore, it is often more practical to consider a wheelchair for the 3-4 year old child.

For transportation of a child who has limited ability to self-propel and will mainly use power mobility for independence, more basic grow-able manual wheelchairs (folding or non-folding options) can be considered. Tilt-in-space wheelchairs are also available in folding options and may be lighter than some of the special needs stroller options.

Wheeled mobility prescription for school-age children

Mobility equipment for school-age children needs to accommodate growth and change in seat-to-floor height over the next few years. Initially, equipment needs to be low to the ground to facilitate transfers or access to tables in the kindergarten and early grade environments.. Transportation in the school bus is often an issue that will need to be considered for the first time, so mobility equipment should be ordered transport ready. Mobility equipment will need to be suitable for use indoors and on the playground.

Independent wheeled mobility options for the school age child

Rigid, lightweight grow-able wheelchairs work well through early elementary school. As children get a little older, rigid chairs with some built-in depth growth can also be considered. Folding wheelchairs are useful for less active wheelers and may be required by families who do not have wheelchair accessible vehicles.

Power mobility options for school age children usually involve using a small size seat on an adult base. Mid-wheel drive options are often chosen for good indoor maneuverability and smooth outdoor ride. Rear wheel drive chairs may be better for rough outdoor conditions but do not have as smooth a ride.

Attendant wheeled mobility options for the school-age child
Grow-able upright and tilt-in-space paediatric wheelchairs are available in folding and rigid versions. Some can be set up in a variety of seat to floor heights to facilitate transfers, foot propulsion and self-wheeling. In rural communities, all-terrain strollers may be desired to allow the child to participate in community outings. Many options are available for children up to 100lbs.

Wheeled mobility prescription for adolescents and young adults

As children move into adolescence, mobility choices will now include adult as well as paediatric equipment. However, it is important to consider that the young adolescent is still likely to grow in width and length.
Independent wheeled mobility options for the adolescent
The adolescent may also have changing mobility needs or abilities into their adulthood. Some children with motor disabilities lose gross motor function as they reach adolescence9. They may also develop pain10 which may change their choice of independent community mobility to a light weight manual chair or a power wheelchair11.
Clinicians need to consider how their clients will keep up with peers and function when they leave high school and home to go on to college or employment. Perhaps more than ever, adolescents will need to consider the impact of their mobility base on their fatigue and/or independence. Independent transportation options need to be considered.
If the adolescent will be primarily using a manual wheelchair, consider options that allow for greater independence around their home and community. For example, an elevating seat will allow the user to have greater access to objects that would otherwise be out of reach. Importantly, this also allows the adolescent to be seated higher for social interaction.
If the adolescent will be using a power wheelchair as his/her primary means of mobility, consider features that may have not have been important previously. For example, power wheelchairs that have a sit-to-stand option will allow the user to independently stand throughout the day. When a sit-to-stand power chair is not an option, a seat elevator may be an appropriate alternative. Power tilt should be considered for the adolescent who is not able to independently off-load or weight shift in the chair. A few degrees of anterior tilt may assist with standing transfers. Adolescents with more complex disabilities and issues of pain and/or pressure may benefit from recline and elevating leg-rests.
Attendant wheeled mobility options for the adolescent
Adult wheelchairs are also available in folding and rigid versions and can be set up to facilitate transfers, foot propulsion and self-wheeling. More durable, folding, and light weight options are important considerations for chairs that need to be transported in the back or trunk of a vehicle. Ease of attendant use and maneuverability outdoors will affect the choices of wheels and casters. A few all-terrain options are available, but transfers may be more problematic with the stroller style mobility devices.

Summary

Many factors need to be considered when prescribing a wheeled mobility base for children. For younger children, parent and care-giver issues are often the predominant influence but, as children grow, participation with peers and in their community becomes a primary influence. Clinicians will need to collaborate with children and their families, considering all of the developmental, social, and environmental issues in order to ensure the prescription of an appropriate wheeled mobility base.

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IC44: Seating for the Complex Child: Why Does it Have to be So Complex?

Simon Hall

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Identify three types of appropriate seating interventions for the complex child.
2. Discuss four factors that contribute to an appropriate seating solution.

This presentation will cover the clinical knowledge needed to provide a range of interventions to people with complex conditions who require a seating service. It will look at the importance of being able to measure your prescribed intervention when related to the person's quality of life and function. It will also look at the need to critically evaluate a range of other interventions, including the use of Botox or surgery.

IC45: Outcome Measures as Part of Quality Assurance in a Seating and Mobility Clinic

Carmen P. Digiovine, PhD, ATP/SMS, RET
Stephanie Meehl, BS
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Personalized Health Care and Accountable Health Care Organizations are phrases that are repeatedly referenced in the health care community, particularly The Wexner Medical Center at The Ohio State University(Sanfilippo, Bendapudi, Rucci, & Schlesinger, 2008; Swan, 2009). A key component of both concepts are outcome measures that focus on user satisfaction measures, which have been implemented as part of the AT Center quality assurance program. Outcome measures are critical in quantitatively describing the quality of the AT services rendered (Cook & Polgar, 2008; Minkel, 1996). Numerous outcome measures exist for Assistive Technology(Cook & Polgar, 2008), in general, and for seating and wheeled mobility in particular(Mortenson, Miller, & Auger, 2008). In 2011, the Assistive Technology Center at The Wexner Medical Center began pilot testing two outcome measures, the Quebec User Evaluation and Satisfaction of Assistive Technology (QUEST)(Demers, Weiss-Lambrou, & Ska, 1996) and the Functional Mobility Assessment (FMA)(Mills et al., 2002), with a focus on the seating and mobility clinic. Based on the successful results from the pilot test, both measures were integrated into the quality assurance model for the ATC. Since the initiation of the outcome measures, the ATC has demonstrated to stakeholders and the medical center leadership the effectiveness of the AT service delivery model to meet the quality assurance goals of the medical center. The purpose of the paper is to demonstrate the development of a quality assurance program within a seating and mobility clinic that includes both outcome measures and a patient-tracking database.

The OSUMC Assistive Technology center is a comprehensive program providing services to individuals with disabilities in communication, computer access, driver rehabilitation, electronic activities of daily living, electronic cognitive devices, seating and mobility, and workplace accommodations. Though individual pieces of the program have been in place throughout the in-patient and out-patient continuum for at least the past 15 years, the establishment of a comprehensive program was formally developed over the past 3.5 years. The largest service is the seating and mobility clinic, which has steadily increased with 606 visits in FY 2010, 758 visits in FY 2011, and 1046 visits in FY 2012.

As a part of continual quality improvement, the seating and mobility clinic began tracking all cases during the 2nd half of FY 2011 (Jan. – Jun. 2011). The tracking process is utilized to ensure that each client receives services in a timely fashion, to document updates generated during the patient paneling process, to provide a mechanism for recording communication with outside collaborators (e.g. wheelchair suppliers and health professionals), and to track outcome measure status. The overarching goal of the clinic is to provide the highest quality services to individuals with a disability as part of a multi-disciplinary team that includes members both internal and external to the medical center.

The QUEST and FMA measures are both indicators for the quality and effectiveness of the clinic and provide feedback for further improvement of the AT Center. The QUEST is composed of 13 items. Twelve of the items are questions on a scale ranging from 1 (not satisfied at all) to 5 (very satisfied) related to client satisfaction regarding the device and service delivery process. For the last item, the client chooses the 3 most important aspects of their assistive technology device and/or the service delivery process from the previous questions.

The FMA is composed of 10 questions on a scale ranging from 1 (completely disagree) to 6 (completely agree) focusing on the clients' mobility, safety, and independence within and outside of the home. The FMA is valuable for someone who comes into the clinic without a mobility device (e.g. cane, crutch, walker, wheelchair) since the measure is not device specific and enables completion of a pre- and post-survey for patient satisfaction. Whereas, the client must already have an assistive technology device in order to complete a baseline survey for the QUEST.

From the initiation of the pilot program through the end of 2012, we have collected over 150 baseline data points on the QUEST and FMA, and almost 40 post-implementation data points in the area of seating and mobility. The effort by the multi-disciplinary team, including clinicians, staff, students, administration and suppliers to get to this point has been significant, and is a direct reflection of the buy-in by all of these stakeholders. Critical to gaining acceptance by the stakeholders has been a feedback mechanism, which provides regular updates and demonstrates the effectiveness of the program. In turn, this creates a constantly progressing system that is able to meet and exceed the expectations of the clients we are serving.

The largest categories, in terms of diagnosis, include spinal cord injury (n=34), other (n=28), cerebral palsy (n=20), muscular dystrophy (n=10) and muscular sclerosis (n=8). The majority of devices were manual wheelchairs (52%), followed by power wheelchairs (26%), Canes (13%), scooters (5%) and other (4%). Both the QUEST and FMA saw improvements in pre/post implementation of wheelchairs (Figures 1 and 2). The results from the outcome measures demonstrate the effectiveness of the assistive technology service delivery model that has been implemented at the ATC. When examining the top three most important categories at baseline for the QUEST (Figure 3), the top three categories include comfort, durability and safety. This demonstrates that most people are concerned with the comfort, durability and safety of the device. Furthermore, consumers are more concerned with the device they receive as opposed to the service they receive. Clinicians find this information useful as they focus on the areas most important to the consumer. There are numerous competing factors when considering the most appropriate device, the information from the outcome measures helps to provide a level of focus for all stakeholders. The implementation of an outcome measure is critical to analyzing the service delivery process, and demonstrating a commitment to improved patient care.

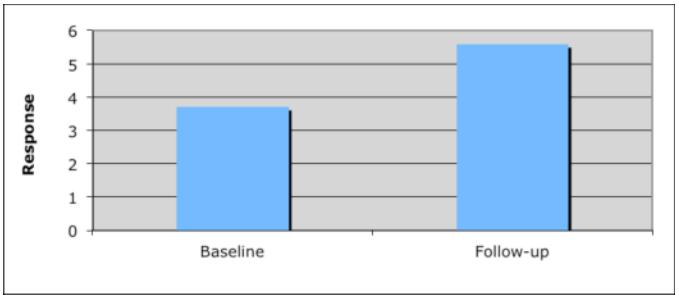

Figure 1. Functional Mobility Assessment. Pre- and Post Device Implementation Averages (n=24).

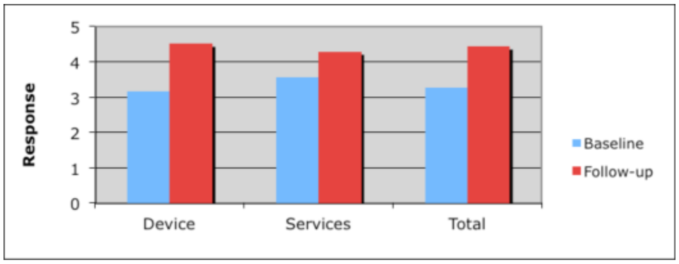

Figure 2. QUEST. Pre- and Post-Device Implementation Averages (n=32)

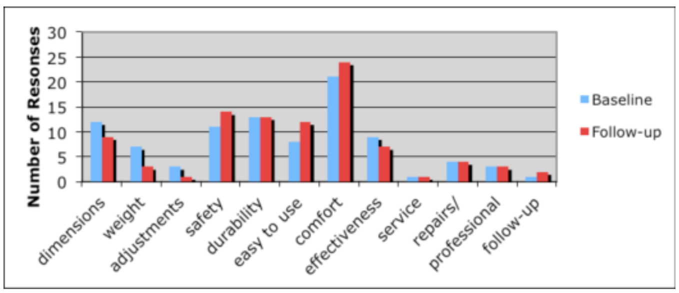

Figure 3. Top three most important categories in the QUEST (n=31) pre- and post-implementation.

As the health care system transition from a fee-for-service model to a pay for perfomance model, patient tracking and outcome measures will become critical in defining the value provided by the seating and mobility service delivery team. Traditionally, value has been defined as the outcome divided by the cost. The Ohio State University Wexner Medical Center has taken a leadership role in transitioning from "Sick Care" to "Health Care" as they create an accountable care organization. As part of this transition, the AT Center, specifically the seating and mobility clinic, have demonstrated the usefulness of a patient tracking system and outcome measures to demonstrate improved outcomes which thereby increases value. The quantiative analysis have improved the timeliness of the services provide by the AT Center, and most importantly, demonstrated the program effectivenss of a multi-disciplinary team to meet the quality assurance metrics set forth by the medical center. The next step is to demonstrate a reduction in cost through improved service delivery processes throughout the seating and mobility service delivery process.

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Figure 1. Functional Mobility Assessment. Pre- and Post Device Implementation Averages (n=24). The figure depicts a vertical bar chart with baseline data and follow-up data. The average value for the baseline data is 3.7, and the average value for the follow-up data is 5.6. Therefore the average baseline data resides between Slightly Disagrees and Slightly Agrees, whereas the follow-up data resides between Mostly Agree and Completely Agree. A higher number indicates a better outcome.

Figure 2. QUEST. Pre- and Post-Device Implementation Averages (n=32). The figure depicts a vertical bar chart with three categories: Device, Services, and Total. Each category is divided into sub-categories of Baseline and Follow-up. Each category shows an increase from above 3 (more-or-less satisfied) for the baseline average to above 4 (quite satisfied) for the follow-up average. A higher number indicates a better outcome.

Figure 3. Top three most important categories in the QUEST (n=31) pre- and post-implementation. The figure dipicts a vertical bar chart with 12 categories. Each category represents a question on the QUEST survey. Each category is divided into sub categories of Baseline and Follow-up. The three categories with the largest frequency of selection as one of the top three most important categories is Comfort, Durability and Safety. This is true for both the baseline data and the follow-up data.

IC46: Wheelchair Configuration as it Relates to Transportation and the Driving Task

Wes L. Perry, MSBME, ATP, CDRS
C. Dan Allison Jr., MS, ATP, OTR/L

One's ability to access transportation greatly increases the scope of opportunities and choices available. It provides the potential for greater personal independence and opens doors to social, vocational, and recreational pursuits. Conversely, the inability to access transportation can greatly hinder such options. Just as it is important to consider the home environment when configuring a wheelchair to best ensure access needs are addressed and functional goals in the home facilitated; it is likewise prudent to consider the factors involved with vehicle use to help ensure access to transportation, and as applicable, facilitate the task of driving.

Vehicle Access

There exist many adaptive equipment and vehicle modification options to facilitate vehicle access for people who use wheelchairs. Lift and ramp systems can provide vehicle access, while allowing the user to remain in his wheelchair. If transferring to a vehicle seat is a reasonable option, power transfer seats and platforms can facilitate transfers to/from the wheelchair. Structural modifications to the vehicle may also be used for vehicle access. Such modifications include a raised roof or doorway to provide added headroom clearance or a lowered-floor to provide both added headroom and an appropriate eye level for someone remaining in a wheelchair.

Wheelchair considerations related to vehicle access

Vehicle access can be greatly impacted by the specific wheelchair configuration and features available. For instance, the overall seated height of a person in a wheelchair can impact doorway clearance and interior headroom. Rear seat height and seat cushion thickness dictate seated height, while the use of tilt or recline seating and removable or flip-back headrest hardware, can be helpful as well in utilizing available clearance.

Wheelchair maneuverability is important to consider due to the relatively limited space in most vehicles. Although wheelchair width and length have bearing on maneuverability in close quarters, perhaps the more dominant factor in such circumstances is turning radius, which is typically dictated by the overall wheelchair length and position of the drive wheels.

Wheelchair width and length, sometimes referred to as the wheelchair "footprint", can have other implications on vehicle access. The wheelbase itself must fit within the space afforded by the lift platform or ramp, and if footrest clearance is insufficient to clear the platform end barrier, the platform must then be long enough to accommodate the entire wheelchair length versus the wheelbase only. Use of tilt seating or elevating/articulating legrests can also be considered to address the latter issue.

Combined wheelchair and occupant weight should be considered, and care taken not to exceed the rated weight capacities of the lift or ramp equipment involved.

Ramp access to lowered-floor minivans can pose a challenge for some manual wheelchair users. It is important to configure optimum wheel position as it relates to both propulsion and balance, while use of grade-aids or power-assist wheels can also assist with ascending a ramp.

Considerations related to transport of unoccupied mobility equipment

Equipment available for transporting unoccupied mobility equipment includes lift systems, ramps, trailers, cargo carriers and a lift/trailer hybrid system.

Adequate clearance will be necessary to load and stow mobility equipment. This should be considered as it relates to available space on the lift platform or ramp, through the doorway, and inside the vehicle, trailer, or carrier. Additional clearance height may be required to account for the lift arm and docking device when loading with an inside-mounted lift. Other wheelchair considerations to utilize the existing height clearance include use of a removable or flip-back headrest, removable or foldable back and back canes, and removable seat.

Weight of the mobility device should be considered and must not exceed the rated capacity of the lift, ramp or carrier. In the case of trailer hitch receiver mounted lifts or cargo carriers, the combined weight of the mobility equipment and lift or carrier must be within the towing tolerances of the vehicle. A vehicle's GVWR (Gross Vehicle Weight Rating) should also be considered. While it is unlikely a wheelchair will directly surpass the GVWR, in many cases, including lowered-floor minivans, the vehicle payload capacity can be significantly limited.

Considerations related to wheelchair and occupant securement

Securement equipment can be divided into two categories: manual and powered. Some versions of manually-operated four-point strap-type tiedown systems must be manually tightened, while others do so automatically. As difficulties using manual tiedowns with wheelchairs became apparent, voluntary wheelchair design standards, (ANSI/RESNA WC19 and ISO 7176/19) were developed to facilitate the proper use of manual tiedowns and improve their performance.

Examples of powered docking systems include the EZ Lock and Dock 'N' Lock. Docking systems typically consist of a wheelchair-mounted bracket and floor-mounted station. When considering use of a docking station for wheelchair securement, one must first determine whether a corresponding bracket is available for the specific wheelchair.

If a bracket exists for the application, one must next ensure the caster width, frame clearance, and front-riggings will allow clearance to access the docking station. In the event an EZ Lock system is used in a driver application, a front stabilizer is required. This stabilizer includes additional hardware, both on the wheelchair and attached to the vehicle floor; consequently, clearance must be available for this as well.

For a seat belt system to fit appropriately and properly secure a vehicle occupant, the shoulder strap should be worn across the shoulder and chest with minimal, if any slack, and the lap belt should lie snug and low across the hips. This often presents a challenge, as common wheelchair equipment features, (such as side guards, lateral supports and some armrests), can impede proper placement of a seat belt. In such a situation, it would be best to consider removable or swing-away components or armrest styles, such as cantilever or flip-back types, that do not interfere with belt placement.

Wheelchair considerations related to the driving task

In the case of a driver remaining in his wheelchair, access to the behind-the-wheel area must be considered. Potential issues related to driver access are outlined as follows.

Height considerations

- Eye level (height) should provide an appropriate line of sight for driving.
- Knee height and positioning should be such that there is no interference with hand control use or steering.

Width considerations

- Clear access width can be restricted by a partial lowered-floor (i.e. driver side only) or the limited space between the driver's door and the middle portion of the dash.
- Excessive wheelchair width may result in positioning the driver off-center and to the right of the steering column. This would potentially interfere with steering wheel use if the driver intends to do so with his right hand.

Length considerations

- An excessively long wheelchair can place a driver further away from vehicle controls and establish a potentially inappropriate visual perspective for driving.

The use of wheelchair armrests can provide beneficial support and alleviate upper extremity fatigue for a driver, but care should be exercised to limit interference with other vehicle equipment. Desk length pads and flip-back, swing-away or removable armrests may also be considered to avoid interference with transfers or access to driving controls.

The vehicle environment is dynamic and warrants concern for rear end collisions and the resulting potential of whip lash, which can occur even at low speeds. Concern for this is magnified for those with complicating medical conditions. Therefore, sufficient back and head support should be considered.

Finally, and perhaps most importantly, it is essential to consider positioning for function as it pertains to the driving task. Failure to do so can not only lead to access barriers, but also, and perhaps more critically, lead to driving errors and potential loss of vehicle control. In this context, a functional seating position should result in a stable, dynamic, relaxed posture from which the person is able to engage in the driving occupation. One should consider the following.

The vehicle environment is predominantly dynamic and not stationary

Postural stability facilitates distal mobility and function

Movement and acceleration of the vehicle can complicate and hinder performance involving human movement, especially when strength or coordination is impaired. Ideally, accommodations to provide added body support and stability should be just that - supportive, but not overly restrictive. Providing this stability may require specific body positioning or the use of support equipment on the wheelchair or vehicle.

Cushion selection can also play an important role with postural stability. For example, an air cushion may be excellent for pressure relief, but with the dynamic movements of a motor vehicle, it may result in significant instability. Conversely a more firm, contoured cushion may provide stability for better function, but compromise pressure relief. One must weigh the pros and cons of different equipment and consider the comprehensive goals.

Appropriate seating and mobility equipment must meet primary goals including personal mobility, comfort, pressure relief, and postural support. Whenever possible, functional goals, including access to transportation, should be accommodated as well.

Resources

1. www.aded.net – ADED: The Association for Driver Rehabilitation Specialists
2. www.nhtsa.dot.gov - National Highway Traffic Safety Administration
3. www.nmeda.org –National Mobility Equipment Dealers Association
4. www.norcalmobility.com/vehicle-selection-101 - Nor-Cal Mobility: Vehicle Selection 101
5. www.rercwts.org – The Rehab Engineering and Research Center on Wheelchair Transportation Safety
6. www.resna.org/resources/position_papers.dot - RESNA's Position on Wheelchairs Used as Seats in Motor Vehicles
7. www.stnonline.com – School Transportation News Magazine

IC47: Telerehab for Self-Management of Lower Limb Swelling in Wheelchair Users

Mary Jo Geyer, PT, PhD, FCCWS, C.Ped, CLT-LANA
Becky Faett, PhD, RN
Charles Vukotich, BS
Sukhmeet Manpotra, MS, OTR/L

Learning Objective

At the conclusion of this workshop, participants will be able to:

1. Identify three unique factors contributing to the development of persistent/irreversible swelling in persons with limited mobility.
2. Describe three essential elements of the novel telerehabilitation (TR) method presented and distinguish the similarities/differences from conventional treatment for lymphedema.
3. Apply the telerehabilitation (TR) method to "live" case scenarios and aid in solving the technical/clinical problems presented.

Chronic lower limb swelling is a significant problem for those with limited mobility. If untreated, swelling becomes irreversible, leading to life-threatening infections, wounds, further loss of mobility and the need for lifelong management. Telerehabilitation (TR), in combination with new strategies for self-management, has the potential to provide a means of overcoming barriers to care and management for those with limited mobility. This instructional session will describe an ongoing research study of a self-management program for lower limb swelling in person with limited mobility delivered via real-time videoconferencing.

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IC48: Prone and Standing PWC Driving Positions: Mock Ups, Trials and Outcomes

Craig Rowitz, MPT, ATP

Introduction

For some individuals, driving a power wheelchair from a seated position is either not possible for physiological reasons, or not functional due to limited sitting time. Many individuals struggle with existing seating systems that limit power chair use. Furthermore, there are individuals who are dependent on caregiver assistance using customized manual chairs who may be independent power chair users if non-traditional driving positions such as full time standing or prone driving positions are used. Compounding the driver's positioning challenges, is the difficulty in adequately funding non-traditional custom power chair systems. Standard therapist authored, physician co-signed documentation can be augmented with vendor authored documentation that focuses on the features, coding decisions (K0108), and configuration explanations that improves the reviewers understanding of the requested system. While not part of the medical record, vendor documentation can describe the mock-up and trial process, provide a further subjective narrative, and help move the reviewer to 'Yes'.
Case A

DB is a 38 year old man with a primary diagnosis of Spina Bifida. He has used multiple manual wheelchairs in the past and is currently using an old folding K0005 with limited independence indoors. His last insurance authorized chair was a manual tilt-in-space frame modified for prone propulsion that he subsequently deemed unsuccessful for any use. His range of motion is extremely limited in his knees and hips preventing him from achieving a traditional sitting posture. He does have the ability to maintain a supported standing position with posterior support for long periods of time. His goal at the evaluation was power mobility. His primary concerns included access to a table for meals and computer use.

Case A Discussion

- Evaluation Summary
- Proof of Concept (Mock Up)
- Authorization Documentation
- Fabrication and Fittings
- Outcomes and Keys to Success

Case B

RK is a 19 year old young woman with a primary diagnosis of Muscular Dystrophy. She has been a long time power chair user who, on evaluation for a new chair, was driving a mid-wheel drive power chair in a "seated" position utilizing 15 degrees of tilt with typical lower body chair contact. Her rear end and posterior thighs were contacting a HP Roho on a traditional seat pan and her feet were positioned on traditional center mount footrest. When driving, she leaned completely forward and rested her chest on her knees, extending her head out over her feet. A compact joystick was mounted from the left armrest which due to her forward positioning, required her to grasp the handle above her left ear. She required the assistance of a caregiver for repositioning at least once every 5 minutes in the chair. Her alternate positioning utilizing tilt and recline required total caregiver assistance. Access to her computer and a table surface was limited by her feet.

Case B Discussion

- Evaluation Summary
- Proof of Concept (Mock Up)
- Authorization Documentation
- Fabrication and Fittings
- Outcomes and Keys to Success

Vendor Authored Documentation

Authorization of complex and non-traditional mobility systems can be greatly assisted through the inclusion of vendor authored documentation. Custom systems are rarely adequately reimbursed with traditional coding. The outcome and function of the custom system frequently requires expanded use of K0108 coding, even for functions that may be labeled with other suggested codes such as E1002 and E2300. While not part of the medical record, this documentation can explain the reasoning behind the coding strategy used in the authorization request, and can help move the reviewer to "Yes".

Documentation Recommendations

- Clearly mark the documentation as vendor authored.
- Use photographs and notation of the successful mock ups.
- Explain the rationale for non-traditional or miscellaneous coding decisions.
- Move the reviewer to "Yes".
- Position yourself as the Craftsman not the Salesman.

Conclusion

Appropriate funding of custom systems can be obtained through use of vendor authored documentation. This documentation is vital to demonstrate the successful proof of concept for non-traditional custom systems, and to justify the expanded use of miscellaneous coding. Vendor authored documentation establishes the vendors role as a craftsman responsible for an outcome rather than the dispenser of a prescribed item. Justification for coding decisions allows for appropriate funding of custom equipment and helps a reviewer envision the final product. People want to say "Yes". Vendor authored documentation is a powerful tool to educate a reviewer and give them permission to make what they consider to be an exception for your client.

Acknowledgements

Both of these seating systems were made possible by collaboration with outstanding clinical therapists. Jonathan Nugent, PT of the Drake Center in Cincinnati, OH was the clinician responsible for the full-time standing system. Mary Ellen Hoffman, OTR/L, ATP and Theresa Berner, MOT,OTR/L, ATP of the OSU Medical Center were the clinicians responsible for the prone driving system.

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Craig received his Master of Physical Therapy at the University of Pittsburgh. He has been providing complex rehab equipment as a vendor for over 10 years and is Co-Owner of Care Medical, Inc. in Cincinnati where he is an ATP. He is also Co-Founder of www.TadpoleAdaptive.com, an online retailer of Pediatric Adaptive Equipment.
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PS6.1: Power Wheelchair Driving Outdoors: Problems and Strategies Identified by Users, and Potential Solutions

Hongwu Wang, PhD
Dan Ding, PhD
Rory A Cooper, PhD

Learning Objective

- Indentify the problems power wheelchair users encountered during their outdoor driving
- Summarize strategies user adapted based on experiences
- Recommend potential solutions to address the problems

Introduction

Advances have been made in the design of electric powered wheelchairs (EPW) over the past 20 years, such as advances in user interfaces, navigation, obstacle avoidance, and improved battery life.[1] However, problems with WCs continue to lead to injuries.[2] For example, problems with the controller lead to incidents in which the user loses some or all control of the WC, and device and control failures account for about 60% of injuries each year.[3] More than 100,000 WC related injuries are treated in emergency departments in the US.[4] According to the U. S. Food and Drug Administration (FDA)Manufacturer and User Facility Device Experience (MAUDE) database, of the 180 incidents reported during July 2000 to June 2001, the most frequent problems occurred with the electric drive, which led to uncontrolled movements, (47%), collisions, (17%) falls and tips (15%).[5] EPW users have complained about the response of the system to the movement of the joystick.[6] And users are often limited in their ability to adjust to hazardous surfaces.[7] In addition, EPW users are inadequately prepared for outdoor driving situations since new EPW users normally receive little to no outdoor driving training.[8,9]

The primary purpose of this study was to identify the challenges with EPW outdoor driving and to explore the strategies user adapter based on their experiences to overcome the problems. A secondary goal of this study was to recommend potential solutions, such as develop terrain dependent EPW driving rules, design new mobility enhancement robotic wheelchair, and create better outdoor EPW driving training materials.

Methods

Three focus group studies were conducted with participants from local Pittsburgh, National Disabled Veterans Winter Sports Clinic held in Snowmass Village, Colorado during March 2009 and the National Veterans Wheelchair Games held in Spokane, Washington during July 2009. Data on the amount of driving training the participant received when they first received an EPW, the quality and adequacy of the training, accidents encountered, rated degree of difficulty on 23 different adverse driving conditions were collected. In addition, user recommended strategies were discussed during each focus group study. User participatory design approach has been used to explore and develop potential solutions to overcome the problems identified.

Results

Focus Group Studies

The most common categories identified were (1) getting stuck due to loss of traction, (2) ran into person in crowded place, and (3) tipping over sideways. These EPW users were most concerned about slipping (loss of traction on the drive wheels), getting stuck (immobilized) on difficult terrain such as gravel, sand, ice, etc. and tipping (loss of stability), which usually happens on cross slopes, at transitions from a slope to horizontal surfaces such as curb cuts, and when driving up and down steep slopes. Users in the interviews shared some useful driving strategies learned through years of experience. For example, it is important when driving on gravel not to drive too slowly or make sudden starts/stops. However, driving fast over gravel was also a problem as the bouncing could set off very uncomfortable spasms in the user or cause their hand to be jostled off the joystick control. The best strategy is to drive as fast as one can tolerate over gravel or sand to avoid bogging down. Ice, snow or other slippery surfaces were identified as requiring similar strategies, such as not making sudden changes in speed and direction. EPW users also suggested driving strategies for slopes and cross-slopes as follows: 1) when driving down a steep slope, tilt the seat back (if possible) so that it moves in the direction of being horizontal; 2) drive straight up a steep slope; and 3) avoid sharp turns on steep slopes. Additionally, it was suggested that EPW users drive along a steep side slope (along the transverse axis) with their joystick pointing somewhat towards the top of the slope in order to avoid causing the lighter uphill drive wheel to slip.

Recommend Solutions

An add-on package to commercial EPWs has been designed and developed where the sensing components can detect different terrains as well as EPW driving parameters (i.e., drive wheel speed, caster wheel speed, EPW accelerations and angular velocities along the longitudinal, lateral and vertical axes), and a tablet computer can record performance variables. A user study with ten able-body subjects showed that performance variables agreed with user perceived ratings on safety, comfort, and ease of operation. Another user study with ten EPW users is in progress where the system with terrains sensing and automated switching of driving rules will be evaluated.

A prototype of a Mobility Enhancement Robotic Wheelchair (MEBot) has been developed. It has two electrical motors to control the motion of the wheelchair, one electrical motor to control the forward-backward movement of driving wheels, four pneumatic cylinders to control the up-down movement of caster wheels and two pneumatic cylinders to control the up-down movement of the driving wheels. The system has six built in force sensors to measure the force distribution on each wheel; six position sensors to detect the location of the four caster wheels and two driving wheels. In addition, an inertia sensor is mounted on the frame of the wheelchair to measure the accelerations and angular velocities of the system. The system is controlled by an embedded system based on single board computer and customized relay system. The current control interfaces for users are joystick, customized buttons and keypads. MEBot features with functions such as automated curb/obstacle climbing, self-leveling control, and could be switched among front, middle and rear wheel drive.

As more is learned about the challenges of driving an EPW in outdoor terrain, the information should be used not only to continue developing new driving control with the goal of creating a higher level of safety and usability for all EPW users, but also creating better driver training tools to be used by drivers and clinicians. A power wheelchair driving courses is to be built with various driving terrains for both indoor and outdoor driving. The course will be used to evaluate the efficiency of current power wheelchair driving training guide as well as create and evaluate the new training materials.

Acknowledgements

The work is supported in part by Quality of Life Technology Engineering Research Center, National Science Foundation (EEC-0540865), the National Institutes of Health (1R03HD048465-01A1), and the VA Rehabilitation Research and Development Service (B3142C). This material is the result of work supported with resources and the use of facilities at the Human Engineering Research Laboratories, VA Pittsburgh Healthcare System. The authors have no conflict of interests to disclose. The contents of this abstract do not represent the views of the National Science Foundation, National Institutes of Health, and Department of Veterans Affairs or the United States Government.

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PS6.2: The influence of Belt Use on Reach and Push Function in Active Wheelchair Users

Allen R. Siekman

Background

Postural stability in wheelchair seating is a key component to successful management of seated posture. In addition, controlling pelvic positioning has been shown to improve stability and function for the person using the wheelchair.1, 2 Many active wheelchair riders who use belts and other postural supports while engaged in wheelchair sports do not use the same type of equipment in their "everyday chair."

Postural Stabilization

The pelvis and lower extremities are primary areas of support in wheelchair use. Manual wheelchair propulsion and other activities can be improved when the pelvis and lower extremities are stable and prevented from unwanted movement.1, 2 It is a common clinical practice to provide a postural belt or other devices when delivering a manual or power wheelchair. The most common exception to this is the lack of belt use by active wheelchair users.

Research Questions / Objectives

The objective of this study was to determine if there was a measurable difference in the functional performance measures for speed, distance, and reach for active manual wheelchair users with and without a positioning belt and to compare a flexible anterior pelvic support (commonly called a "hip belt" or "webbing belt" with a more stiffened anterior pelvic support (commonly called a "stiffened hip belt" or "pelvic stabilizer").

Methods

The following tasks were completed for 10 manual wheelchair users using (a) no pelvic positioning support, (b) a webbing pelvic belt, and (c) an stiffened hip belt: Forward, lateral, and downward reach, 5-meter distance push and distance traveled with a single push up a ADA 1:12 ramp.

Forward, lateral, and downward reach testing was performed using methods outlined in a previously funded NIH study.3 Subjects were asked to sit upright in a resting position. The start position was recorded and subjects were instructed to reach as far as possible and return to the resting position. The maximum reach was recorded. Three trials were performed for each subject for both the left and right sides. Reach test did not allow support with non-reaching arm.

Time to complete a 5-meter distance was performed on a flat, smooth surface. Subjects were instructed to propel as fast as possible through the finish line. Three trials were performed for each subject in each test configuration (a-c).

Distance traveled with a single push was performed up an ADA compliant ramp with a 1:12 incline. Subjects were instructed to apply one hard push to try to go as far as possible up the ramp. The maximum forward position of the front casters was marked and the distance traveled was recorded to the nearest 0.5 cm. Three trials were performed for each subject in each test configuration.

Postural support mounting angle is a very important consideration when providing postural stability and control. Traditionally, the most common mounting angle for postural belts has been at 45° with the belt pulling downward across the top of the pelvis. In this configuration the 45° belt angle pulls the top of the pelvis to the rear and does not allow normal anterior and posterior range of motion at the pelvis. A 45° belt angle can cause significant restriction in reaching range, especially in the forward reach direction. Brackets were attached to the test subjects' wheelchair to allow quick changes of the postural support devices. Mounting locations were selected to allow a belt angle of approximately 70° to 80°. This belt angle provides excellent postural control without restricting anterior/posterior pelvic range of motion (ROM) by pulling the pelvis into posterior tilt.

Study Population

Ten subjects with spinal cord injury (SCI) participated in this study. The subjects included 8 males and 2 females with differing levels of Spinal Cord Injury, 2 lumbar, 3 thoracic and 5 cervical. The subjects ranged from 27 to 64 years of age (average 42 years), 163 to 183 cm in height (average 177 cm), and 59 to 82 kg body weight (average 71 kg). All subjects used a wheelchair for their primary means of mobility (1 to 32 years of manual wheelchair use, average 14 years).

Equipment Used

All test subjects used their personal "everyday" wheelchair for this study. Two types of anterior pelvic supports were used. One type is a flexible anterior pelvic support (2-point padded webbing belt with a latch style buckle). The second type was a stiffened anterior pelvic support, (2-point padded stiffened belt with latch style buckle). The stiffened belt uses molded thermoplastic components instead of the traditional webbing.

Data Analysis

The reach measurements were calculated as the distance between the upright resting start position and the furthest reach distance obtained. The average reach obtained from the 3 trials on the left side and the 3 trials on the right side were calculated for each subject in each test configuration (a-c).

The average time to complete the 5-meter distance over 3 trials was calculated for each subject in each test configuration (a-c).

The average distance traveled during a single push up a ramp over 3 trials was calculated for each subject in each test configuration (a-c).

Results

Forward Reach Test

All 10 subjects reached farther in both the left and right side forward reach test using either the Pelvic Stabilizer or webbing belt than using no pelvic support.
either the Pelvic Stabilizer or web belt.

Table 1. Forward Reach (Right, Left) (cm)

Average*	Left (cm)	Right (cm)
No Belt	21	20
Webbing Belt	27	26
Pelvic Stabilizer	27	26

* Value for each of 3 trials averaged for each test subject then averaged for all 10 subjects.

Lateral Reach Test

All 10 subjects reached farther in the lateral reach test using either the Pelvic Stabilizer or web belt.

Table 1. Lateral Reach (Right, Left) (cm)

Average*	Left (cm)	Right (cm)
No Belt	16	13
Webbing Belt	19	16
Pelvic Stabilizer	20	16

* Value for each of 3 trials averaged for each test subject then averaged for all 10 subjects.

Downward Reach Test

Nine out of 10 subjects reached farther in the right side downward reach and all 10 subjects reached farther in the left side reach test using either the Pelvic Stabilizer or web belt.

Table 2. Downward Reach (Right, Left) (cm)

Average*	Left (cm)	Right (cm)
No Belt	14	14
Webbing Belt	17	18
Pelvic Stabilizer	20	17

- Value for each of 3 trials averaged for each test subject then averaged for all 10 subjects.

Time/Distance Test

Seven out of 10 subjects were faster during the 5-meter distance test using either the pelvic support or web belt than when using no pelvic support.

Table 3. Time to complete a 5-meter distance (seconds)

Average*	Speed (Sec)
No Belt	3.67
Webbing Belt	3.66
Pelvic Stabilizer	3.55

* Value for each of 3 trials averaged for each test subject then averaged for all 10 subjects.

Single Push Test

Four out of 10 subjects had a greater distance traveled up a ramp with a single push using either the pelvic stabilizer or webbing belt than when using no pelvic support

Table 4. Distance traveled with a single push (cm)

Average*	Distance (cm)
No Belt	152
Webbing Belt	153
Pelvic Stabilizer	151

*Value for each of 3 trials averaged for each test subject then averaged for all 10 subjects.

Discussion

Using a postural support increased function in several of the tests. Most noticeable was the improvement in the reaching tests. Forward reach increased for all subjects and increased lateral and downward reach for all but one subject.

Using a postural support increased propulsion speed for 7 out of 10 subjects. It should be noted however that the increase in speed in this test, while positive, was very small.

The functional measure of distance traveled with one push seemed to support the use of no pelvic support. It is felt by the researchers that this is probably due to the design of the test and is probably not a good indicator of the potential benefit of postural support use. Examining the video records of the test show that the test subjects put a great deal of effort into maximizing the push distance in a single push with no regard to being able to complete additional pushes. It is felt that had the test required multiple pushes, the test subjects would have pushed in a more normal fashion, which could have a substantial effect on the test results. Future testing should be done using a set amount of multiple pushes, i.e., three pushes, since repositioning after a push is strongly affected by pelvic support.

These results suggest that pelvic support increases functional reach and speed for manual wheelchair users. Data suggest that having different options in pelvic support devices is beneficial for manual wheelchair users in order to meet their specific, individual needs.

These results demonstrate that postural supports such as a webbing belt or a semi-rigid pelvic stabilizer are viable options for manual wheelchair users

This study demonstrated that pelvic support increases some functional performance measures in people with spinal cord injury for ten people. Further testing should be done with a larger subject pool and include broader populations using manual wheelchairs such as stroke, cerebral palsy, muscle weakness disorders and amputees.

Conclusions

Anterior pelvic support devices fitted at a 70° to 80° mounting angle can increase functional performance for forward, lateral, and downward reach for people that use manual wheelchairs.

Anterior pelvic support devices fitted at a 70° to 80° mounting angle may increase pushing speed for people that use manual wheelchairs. Testing over longer distances may provide more significant results.

While there is a potential for improvements in manual wheelchair mobility, the pushing tests conducted in this study were not able to provide data to prove or disprove this hypothesis. The test should be changed to include multiple pushes up the ramp.

Acknowledgements

Funding for this study was made possible through a grant from Bodypoint Inc, Seattle, Washington, USA.

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PS6.3: Use of an Environmental Control Unit by a Power Wheelchair User in Higher Education

Laura A. Rice, PhD, MPT, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Correctly verbalize three benefits of using an environmental control unit in a residence hall setting for power wheelchair users with significant physical disabilities who are enrolled in a higher education institution.
2. Verbally describe three alternative uses for environmental control units outside of a traditional home setting.
3. Provide three specific recommendations to power wheelchair users who are interested in attending a higher education institution.

Due to mobility limitations, it is often difficult for power wheelchair (PWC) users with significant physical disabilities to attend college and live in a traditional residence hall. Individuals are often limited to schools close to home or taking on-line courses. Such limitations may not allow PWC users to pursue desired majors, attend the college of his/her choice or experience a traditional “college life.” The use of new technology, specifically environmental control units (ECUs), may help to bridge the gap. Previous research has found that ECUs increase independence, quality of life and socialization; however, use has not been evaluated in a higher education setting.

To evaluate the potential benefits, a pilot study was performed with a PWC user living in an accessible residence hall. The participant is 19 years old and has a primary diagnosis of osteogenesis imperfecta. After agreeing to participate, ECU equipment was installed in the participant’s room. The ECU is a web-based application that allows the student to control devices (via a wireless control node) in the residence hall room from any internet ready device. The participant was trained on use of the unit during a one-hour session with the manufacturer’s representative. After receiving University of Illinois IRB approval and obtaining informed consent, data was collected on the specific items the student accessed with the ECU between March and May 2012. Preliminary results have found that the participant accessed the door to the room most frequently (69.7% of commands) and changed bed position least frequently (11.7% of commands). The ECUs are used most frequently from 6 pm – 11:59 pm (62.1% of commands were given during this period) and used the least between 12:00 am and 6:00 am (7.6 % of commands). Subjectively, the participant reported the ECU increased independence, QOL and sense of control. Additional data needs to be collected to further determine the benefits of ECUs in a higher education setting.

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PS6.4: Staying on Track – Evaluating the Efficacy of Power Wheelchair Tracking

Lois Brown, MPT, ATP/SMS
Michelle L. Lange, OTR, ABDA, ATP/SMS

Tracking technology has been available on certain complex rehab power wheelchairs for a number of years. This tracking technology varies in design, but shares the same goal of increasing driving efficiency, particularly for consumers who do not use a joystick. When completing a turn in a power wheelchair, the casters are skewed, or facing to one side. When a Forward command is sent (by activating the Forward switch), these casters "pull" the wheelchair to one side before straightening out and moving the chair in a forward direction. The consumer must activate the Left and/or Right directional switches to compensate for this. Varied terrain, slopes and inclines also "pull" the wheelchair off course by turning the casters. Tracking technology compensates for these influences and keeps the power wheelchair on the course dictated by directional switch inputs. Several distinct technologies are used to achieve this.

General clinical consensus is that tracking technologies increase driving efficiency, however this has not been proven in any formal manner. A protocol was developed and followed on June 20, 2011. A course was marked out on a smooth level surface (gym floor) with tape. Four trials were completed. A single volunteer drove in each of the 4 trials (18 year old female, no motor, sensory or cognitive limitations). The first trial was with a midwheel drive power wheelchair (Invacare TDX SP) and 3 AbleNet Jellybean switches on a tray (Forward, Left, Right). Driving parameters were programmed and remained the same throughout the first trial. The time to complete the course was recorded, as were the number of switch activations of each switch. In the first trial, the volunteer completed the course 3 times without tracking technology and 3 times with tracking technology (Invacare G-Trac). The switch activations for each of the 3 runs were averaged and the averaged results compared for course completion with and without tracking. The second trial used the same midwheel drive power wheelchair with a head array. The third trial used a front wheel drive power wheelchair (Invacare FDX) with 3 switches on a tray. The fourth trial used the same front wheel drive power wheelchair with a head array. Each trial required the volunteer to complete the course 3 times without tracking technology and 3 times with tracking technology.

Final Summary

Trial 1: Invacare TDX SP midwheel drive, 3 switches on tray

- 57% less switch hits
- 38% less time

Trial 2: Invacare TDX SP midwheel drive, Head Array

- 69% less switch hits
- 47% less time

Trial 3: Invacare FDX front wheel drive, 3 switches on Tray

- 76% less switch hits
- 52% less time

Trial 4: Invacare FDX front wheel drive, Head Array

- 73% less switch hits
- 48% less time

IC49: Enhancing Your Practice Through Sustained Consumer Engagement

Nick Libassi
Ann Eubank, LMSW, OTR/L, ATP, CAPS

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. State three aspects of sustained consumer engagement.
2. State two ethical dilemmas and possible solutions.
3. State a definition of consumer empowerment.

This session will discuss how healthcare practitioners can better partner with consumers to affect consumer empowerment and positive policy change, both locally and nationally. This empowering partnership can enhance clinical practice and provide more opportunities for consumer independence.

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IC50: That's Just Wrong - Using Seating Disasters to Improve Future Prescriptions

Stefanie Laurence, OT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify at least three common errors in equipment prescription.
2. Describe fundamental elements for successful seating prescriptions.
3. Discuss the importance of linking assessment findings to generic prescription goals.

Seating technology is ever-evolving and changing. But despite the latest and greatest advancements, successful seating still needs to start with the basics. A glass-half-full view always takes into account circumstances that might have influenced a prescription; but, sometimes, prescriptions are just wrong. Case studies will be used to review basic requirements for functional seating systems, illustrate what can go wrong when they are overlooked and the elements that need to be considered to ensure success in the future.

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IC51: Why, When and How to Introduce Self-Mobility in Young Children

Silvana Contepomi, PT

Objectives

At the conclusion of this workshop, participants will be able to:

1. Introduce the philosophy to providing children exposure to self-initiated mobility and identify three reasons for the importance of augmentative mobility.
2. Discuss assessment and intervention strategies for children who use devices as self-produced locomotion.
3. Identify relevant stages of progression for learning to operate a power mobility device in children.

Independent mobility is an inherent characteristic of human being. What happens when the child is not able to move by himself? How early should we start with mobility? How do we start?

Children with independent mobility are active entrepreneurs in life and not passive receptors of experience.
After 10 years of experience in mobility programs for children with cerebal palsy, I would like to share our experience regarding why, when and how to introduce self-mobility in the very young population.

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IC52: Do the Coverage Criteria Match My Client's Functional Needs

Elizabeth Cole, MSPT

Your goal is to provide the equipment that best meets the individual's medical, physical and functional needs. This can be significantly hindered by issues with some current Medicare coverage criteria for wheeled mobility and seating. Some of these criteria do not reflect current technology. Others are too vague, leaving questions as to who is eligible. And still others are too prescriptive, to the point of preventing many individuals from obtaining these products. It is therefore critical to be familiar with the criteria in order to identify if the individual qualifies for the product and to include the appropriate information in the documentation. It is also important to know who is clinically appropriate for which particular type of device and how to justify this when criteria is vague or limiting.

Medicare Coverage Criteria for Manual Wheelchairs

Before an individual can qualify for a particular type of manual wheelchair, he/she must meet the criteria for any type of manual wheelchair. The individual:

- Must have a mobility limitation that impairs his/her ability to participate in MRADL's entirely, or within a reasonable time frame or safely without mobility equipment
- The wheelchair is for use in the home
- The mobility deficit cannot be resolved using a cane or walker
- The individual is capable and willing to consistently use the manual wheelchair or has a caregiver who is willing to assist in use of the wheelchair.

Standard Manual Wheelchair (K0001)
There are no additional Medicare criteria for an individual to qualify for a standard manual wheelchair.

Clinically, an appropriate individual for this type of wheelchair should meet the following:

- Has good postural control with minimal or no postural deformities
- Is able to sit in standard (limited) seat sizes without compromise to function, skin or posture
- Has a mild activity level
- Does not experience discomfort with prolonged sitting
- If self-propelling, can functionally propel the weight of the standard chair to complete all required activities throughout the day
- Uses the wheelchair only for short time periods for short distances

Standard Hemi Manual Wheelchair (K0002)
To meet the Medicare criteria for a K0002, the individual:

- Requires a lower seat to floor height (STFH) of 17" - 18" due to short stature or to enable the individual to place his/her feet on the ground for propulsion

Clinically, an appropriate individual for this type of wheelchair should meet the following:

- Same clinical criteria as for a K0001 plus
- Is able to propel the weight of a standard wheelchair at this STFH using one or both feet to complete all required daily activities

Keep in mind that a 17 or 18" STFH may not be truly low enough to allow good foot propulsion or safe standing transfers for many people. This is especially true when a 2 – 3" cushion is placed on top of the seat rails. A STFH that is too high will cause the individual to slide forward or rotate in the seat in an attempt to place the foot/feet flat on the ground for propulsion. This in turn results in issues with skin integrity, function and comfort. For many individuals, the ultra-hemi STFH available on higher coded wheelchairs may be needed.

Lightweight Manual Wheelchair (K0003)
To meet the Medicare criteria for a K0003, the individual:

- Cannot self-propel in a standard wheelchair in the home; and
- Can and does self-propel in a lightweight wheelchair

Clinically, an appropriate individual for this type of wheelchair should meet the following:

- Is able to sit in standard (limited) seat sizes without compromise to function, skin or posture
- Has good postural control with minimal or no postural deformities
- Has a mild activity level
- Does not experience discomfort with prolonged sitting
- Propels primarily on flat, level surfaces indoors
- Lacks the physical ability to propel the weight of a standard wheelchair, but can propel the lightweight to complete all daily activities or uses the wheelchair part time

The criteria for a K0003 are vague and are based primarily on the individual's inability to propel the weight of a standard wheelchair. And the primary (sole?) difference between most K0003's on the market and a K0001 is the decrease in weight (34 – 36 lbs versus > 36 lbs). Therefore, it is necessary to identify why an individual cannot propel the weight of the standard wheelchair. This could include, but is not limited to decreased upper extremity muscle strength; poor endurance or functionally limiting fatigue due to disability, de-conditioning, age, or other factors; impaired coordination; increased or decreased tone; functionally limiting pain from joint dysfunction and/or; cardiac and/or pulmonary compromise

Highstrength Lightweight Manual Wheelchair (K0004)
To meet the Medicare criteria for a K0004, the individual:

- Self-propels the wheelchair while engaging in frequent activities in the home that cannot be performed in a standard or lightweight wheelchair and/or
- Requires a seat width, depth, or height that cannot be accommodated in a standard, lightweight or hemi wheelchair, and spends at least 2 hours per day in the wheelchair

One way to justify a K0004 would be the individual's inability to complete all daily activities throughout the day in a K0003 due to the added weight of the K0003 (34 – 36 lbs versus 30- 34 lbs). Since Medicare only pays for what is medically necessary in the home, this alone might be difficult to measure or document. However, there are a number of features found on some K0004's that are not available on any K0003. If one or more of these are necessary to allow the individual to complete his/her daily activities safely and in a timely manner, this could be a valid justification for the K0004. These features include the following:

Many K0004s have additional seat dimensions other than the standard 16, 18 and 20" wide by 16" deep seat or the 17 or 19" back height. For some individuals a wider or narrower seat width, shorter or longer seat depth or higher or lower back height may be necessary to allow them to maintain optimal position, prevent harmful postures, avoid skin breakdown and allow maximum function. Documentation should identify the specific dimensions required and why they are needed. Some K0004's also provide frames with an ultra-hemi STFH (as low as 13 – 14"). This may be needed to achieve a good heel strike for proper foot propulsion, safe standing transfers and/or access to various surfaces or objects in the environment.

Some K0004 models have a minimally adjustable rear wheel position and an adjustable caster housing which allow the frame to be configured in a small amount of fixed tilt. For some individuals, this makes it easier to maintain an upright and midline posture against gravity. Some K0004s also have backposts that provide minimal seat to back angle adjustment. For individuals with flexible postural deformities, this can help maintain proper pelvic and trunk posture, decrease fatigue, increase comfort and/or provide optimal positioning for functional activities. For individuals with a fixed posterior pelvic tilt and spinal kyphosis, an open seat to back angle can accommodate the person's shape, which allows full use of the seat depth, increased contact with the seat and back surface, improved visual field and increased comfort.

Ultra Lightweight Manual Wheelchair (K0005)
To meet the Medicare criteria for a K0005, the individual must qualify under individual consideration as there are currently no specific coverage criteria (as of November 2012). We must look at the specific and unique features of the K0005 and document why these are necessary for the individual client. These features are described below.

By definition a K0005 is <30 lbs, however there are many on the market that weigh 20 lbs or less. The lower weight creates significantly less rolling resistance, which translates into fewer strokes to get from point A to point B and less force per stroke. This puts less stress on the upper extremities with less risk of repetitive strain injury and decreased overall fatigue. This is especially important for individuals who are or will be long term manual wheelchair users.

All K0005s are available in multiple seat widths and depths and multiple adjustable back heights. There are many individuals who require very specific seat and back dimensions to avoid postural deformities, prevent skin breakdown, maximize function, decrease discomfort and increase sitting tolerance. Appropriate seat dimensions could also affect the overall size of the wheelchair, which affects accessibility. The documentation should be specific as to what dimensions are needed that cannot be found on a lower coded wheelchair and the potential harmful results of seating that does not fit appropriately.

All K0005s have a fully adjustable axle plate or rear wheel position. Adjusting the rear wheel forward provides improved access to the handrim and improved upper extremity position during each stroke. This allows for more efficient and easier propulsion and significantly decreased risk of upper extremity stress and damage. Adjusting the rear wheels up or down vertically on the frame can provide multiple degrees of fixed tilt to help maintain posture and balance. It also changes the vertical access to the wheel for more efficient propulsion and provides multiple choices for STFH. Lateral adjustments of the rear wheel position can provide improved wheel access and appropriate overall width of the wheelchair. Cambering the wheels can add to efficiency of propulsion, as well as improved wheel access. The multiple positions in each direction allow for tailoring of the configuration to each individual.

Some K0005's have options for suspension in the frame or caster components. This can reduce shock and vibration, which can decrease back pain, decrease fatigue and, for some, can reduce the triggering of spasticity. Some rigid frame K0005's can be configured with a closed seat to back angle ("squeeze" seat) which can secure the pelvis and reduce risk of sliding, encourage an upright trunk and, for some, help manage extensor spasticity in the pelvis and legs. Most K0005's have multiple choices for tighter front frames and/or hanger angles, which provide a shorter overall length for accessibility and maneuverability, tighter knee angles to accommodate joint limitations or discomfort, and improved aesthetics.

It is particularly important with the K0005's to document the person's specific physical and functional needs and a list of all relevant daily ADLs and IADLs, as well as the specific features of the K0005 that are needed, why they are needed, how they address the person's needs and how they will improve function. It is also critical to identify that these features are not available on a K0004.

Medicare Coverage Criteria for Power Wheelchairs

Medicare categorizes all power wheelchairs as Group 1, Group 2, Group 3, Group 4 or Group 5. These groups are differentiated by performance characteristics, such as top speed, battery range, obstacle climbing, safety on inclines, frame suspension, ability to upgrade electronics and ability to accommodate a ventilator. Before an individual can qualify for a particular type of power wheelchair, he/she must meet the criteria for any type of power wheelchair. The individual:

- Must have a mobility limitation that impairs his/her ability to participate in MRADL's entirely, or within a reasonable time frame or safely without mobility equipment
- The wheelchair is for use in the home
- The mobility deficit cannot be resolved using a cane, walker, optimally configured manual chair or scooter
- The individual is capable and willing to consistently use the power wheelchair or has a caregiver who is willing to assist in use of the wheelchair.

To qualify for a power wheelchair, the individual does not need to be completely non-ambulatory, nor is prior use of a manual wheelchair and/or scooter necessary. However, the power wheelchair must be medically necessary to complete daily activities in the home.

Group 1 Power Wheelchairs
There are no additional Medicare criteria for an individual to qualify for a Group 1 power wheelchair.

Clinically, an appropriate individual for this type of wheelchair should meet the following:
- Requires the power chair for short distance mobility at slow speeds on level surfaces for short time periods
- Has good sitting balance and does not require external postural supports
- Fits in limited standard seat sizes without compromise to posture, function or skin
- Does not have a progressive condition

Group 2 Power Wheelchairs
There are no additional Medicare criteria for an individual to qualify for a Group 2 power wheelchair.

Clinically, an appropriate individual for this type of wheelchair should meet the following:
- Requires greater performance capabilities than provided by Group 1 to complete all necessary activities each day
- Uses power for much or most of his/her mobility needs
- Has a mild to moderate activity level and travels on level or mildly uneven surfaces
- Needs or may need power tilt and/or elevating legrests (must identify why)
- Needs or may need a drive control other than a standard joystick

Since the coverage criteria for a Group 2 is no different from that of a Group 1, the appropriate choice would be based on the individual's activity level, distances traveled, typical terrains and amount of time spent in the wheelchair.

Group 3 Power Wheelchair
To meet the Medicare criteria for a Group 3, the individual:
- Has a neurological condition, a myopathy, or congenital skeletal deformities
- Has had a specialty evaluation by a PT, OT or physician with training and experience in wheelchair evaluations who documents the medical need
- The wheelchair is provided by an ATP who specializes in wheelchairs and who has direct, in-person involvement in the wheelchair selection

Clinically, an appropriate individual for this type of wheelchair should meet the following:
- Uses power as the primary means of mobility
- Has a moderate to high activity level and travels on level to uneven terrain with minimal to moderate obstacles and inclines
- Has a greater need for positioning support
- May have changing medical and/or functional needs
- Has moderate spasticity that requires a more robust frame
- Needs or will need multiple power seat options and/or a ventilator tray and battery
- Needs drive wheel suspension
- Requires enhanced performance features for safety, maneuverability, efficiency or timeliness of driving
- Needs a combination of client weight capacity, specific seat size, increased performance and/or other options that are not available on a Group 2

The criteria for this group of power wheelchair is based primarily on whether or not the individual's condition falls into one of 3 disability groups rather than on the individual's functional and physical needs. Unfortunately, therefore, there are individuals who truly need the features offered by a Group 3 who cannot access this technology because of their specific diagnosis.

Group 4 Power Wheelchairs
These power wheelchairs are not covered, since Medicare considers that the added features on a Group 4 are only needed for outdoor mobility.

Clinically, an appropriate individual for this type of wheelchair should meet the following:
- Has a high activity level requiring highest speeds, longest distances, and most powerful motors to carry out all activities of daily life both indoors and outdoors
- Is unable to obtain the needed combination of seat dimensions, postural supports, dynamic seating, alternate controls, performance features or weight capacity on a comparable Group 3
- Requires the most robust frame due to significant spasticity and/or activity levels
- Requires a standing feature on the power chair for function and medical health

There are individuals who truly need the features offered by a Group 4 who cannot access this technology because Medicare will only pay for what is medically needed in the home. Unfortunately they do not take into consideration the outdoor activities that are an integral part of many individuals' lives.

Medicare Coverage Criteria for Wheelchair Seat and Back Cushions

Before an individual can qualify for a particular type of seat cushion or back support, he/she must meet the criteria for any type of seating product. To do this, the individual must have a wheelchair and must meet the Medicare coverage criteria for that wheelchair

General Use Cushions and Backs
There are no additional Medicare criteria for an individual to qualify for a general use cushion or back. If an individual has a manual wheelchair and meets the Medicare coverage criteria for that particular wheelchair, they qualify for both. Therefore, all of these individuals should get at least a general use cushion and possibly a general use back support. However, if they are in a power wheelchair and do not meet the coverage criteria for either a skin protection or positioning cushion, Medicare considers that that their needs can be met with a Captain's seat. In these cases, a general use cushion or back will not be covered.

Skin Protection Cushions
To meet the Medicare criteria for a skin protection seat cushion, the individual must meet either of the following:
- Has a past history or current pressure ulcer in area of contact with the seat surface (must use ICD-9 code 707.03, 707.04 or 707.05) or
- Has absent or impaired sensation in the area of contact with the seat surface or inability to perform a functional

weight shift due to one of the following qualifying diagnoses: spinal cord injury or other spinal cord disease, Multiple Sclerosis or other demyelinating disease, Cerebral Palsy, anterior horn cell diseases, including Amyotrophic Lateral Sclerosis, post-polio syndrome, traumatic brain injury resulting in quadriplegia, Spina Bifida, childhood cerebral degeneration, Alzheimer's Disease, Parkinson's Disease, Muscular Dystrophy, hemiplegia, Huntington's Chorea or idiopathic torsion dystonia

Keep in mind that the existing or prior skin breakdown does not need to be an open wound. A Stage 1 pressure ulcer is defined by the National Pressure Ulcer Advisory Panel as "intact skin with non-blanchable redness of a localized area usually over a bony prominence".

Unfortunately, the coverage criteria for cushions and backs are prescriptive to the point of requiring specific ICD-9 diagnoses codes. As clinicians and providers, we know that this is not best practice. The equipment choice should be based on the individual's physical and functional status and needs. The selection of a skin protection cushion should also be based on existing risk factors for skin breakdown such as aging skin, incontinence, decreased mobility, pain, joint limitations, deconditioning, decreased resistance, compromised immune systems, poor nutrition, cognitive and behavioral impairments and/or poor family/caregiver support. Unfortunately because certain individuals lack a qualifying diagnoses required by this limited coverage criteria, they cannot access the appropriate cushion despite significant risk factors for skin breakdown. This can include, but is not limited to individuals with amputations, decreased cognitive abilities and/or developmental delay, rheumatoid or osteoarthritis, arthrogryposis, diabetes, Guillian Barré, Osteogenesis Imperfect, dementia or advanced age.

Positioning Cushions and Backs

To meet the Medicare criteria for any positioning seat cushion or back, the individual must:

- Have significant postural asymmetries due to one of the same qualifying diagnoses listed above for skin protection cushions or one of the following diagnoses: monoplegia of the lower limb, spinocerebellar disease, above knee amputation, Osteogenesis Imperfecta or transverse myelitis

Keep in mind that the postural asymmetry does not need to be severe or fixed in order to be considered "significant".

As with skin protection cushions, there are a number of individuals who cannot obtain a positioning cushion or back due to lack of a qualifying diagnosis. This can include, but is not limited to individuals with decreased cognitive abilities and/or developmental delay, rheumatoid or osteoarthritis, arthrogryposis, diabetes, Guillian Barré, dementia or advanced age.

Skin Protection and Positioning Cushions

To meet the Medicare criteria for a skin protection and positioning seat cushion, the individual must meet both of the following:

- Meets one or both of the criteria for skin protection cushions
- Meets the criteria for a positioning cushion

As with the other cushions and backs, basing the criteria primarily on diagnoses codes alone does not take into account the person's specific physical or functional status or any risk factors for skin breakdown or postural deformities. This results in the inability of some individuals to obtain the most appropriate and safe seating products for their unique needs.

Custom Cushions and Backs

These products are custom made for a specific individual using molding or specific anatomical measurements. To meet the Medicare criteria for a custom seat cushion or back, the individual must meet both of the following:

- Meets one or both of the criteria for a prefabricated skin protection cushion
- Meets the criteria for a prefabricated positioning cushion or back
- Has had an evaluation by a licensed clinician who documents why a prefabricated product is insufficient

When prescribing the most appropriate wheeled mobility or seating product for a Medicare beneficiary, we should follow best practice, which is to recommend what is most functional for each individual based on his/her specific physical and functional needs. However, we must also be familiar with Medicare's coverage criteria for those products to determine if the individual actually qualifies for the selected product(s). We must know how to document the medical justification when the criteria are vague and understand our options when the criteria are too limiting, too prescriptive or do not follow best practice. In some cases, we may need to pursue other options such as an Advanced Beneficiary Notice (ABN) and cash payment for the product, or the appeals process.

IC53: The Role of Friction and Shear Forces in Pressure Ulcer Generation

Mark Payette, CO
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Abstract

Friction and shear contribute to pressure ulcer generation. Basic engineering principles, dynamic and static loading conditions, the partnership between pressure and friction/shear, and methods for controlling friction to reduce shear will be presented. A hands-on segment will be offered to provide the opportunity for participants to experience for themselves how controlling friction at the interface level of a seat support surface can be used as a way to reduce shear loading.

Background

Pressure ulcers result in devastating consequences. For a wheelchair user, it can mean months of bed rest and hospitalization. In addition, after a pressure ulcer has healed, the skin never fully recovers. Scarring, adhesions and tissue loss in the wake of a pressure ulcer heighten future risk. As a person ages, tissue and circulation gradually become less resilient and viable.

Because of the effects of aging, the margin of safety for people using wheelchairs narrows year by year, and the likelihood of something triggering skin breakdown increases. Pressure ulcers can destroy careers, upend lifestyles, reduce independence and lead to depression. They can ultimately lead to repeated amputations reaching the trans-pelvic level. Septic conditions can be very difficult to control and lead to death.

More than 2.5 million decubitus ulcers are treated each year in the United States. The two major groups of people who have decubitus ulcers are the disabled elderly and people with spinal cord injuries. The number of people with traumatic SCI is approximately 259,000 according to the National Spinal Cord Injury Statistical Center. The yearly incidence of pressure ulcers among people with SCI using wheelchairs is in the range of 25-66%. A conservative estimate of the number of people with SCI who develop a pressure ulcer is therefore 65,000 every year. People with SCI are not the only users of wheelchairs who battle decubitus ulcers. Other diseases such as multiple sclerosis and stroke can also result in compromised protective sensation. Therefore, the minimum number of users of wheelchairs with pressure ulcers is greater than 65,000. The number at risk is greater yet.

According to data from the Center for Medicare Services (CMS), the average cost per case for Medicare patients with decubitus ulcers was $43,180 in fiscal year 2007. Based on these numbers, a conservative estimate of the annual direct healthcare costs related to treatment of decubitus ulcers for people using wheelchairs could be $2.8 billion (65,000 x $43,000). Estimates put United States expenditures on the treatment of decubitus ulcers as high as $11 billion. Therefore the projection of $2.8 billion related to treatment of decubitus ulcers for people using wheelchairs seems reasonable.

Pressure Ulcer Generation Factors

Virtually all pressure ulcers form under or very near weight bearing bony prominences. Three local factors contribute to the generation of decubitus ulcers: pressure, microclimate (temperature and moisture), and shear. Systemic factors (e.g., vascular health, muscle tone, nutrition, age, etc.) and global factors (client education, motivation, lifestyle, program follow-up, etc.) also contribute to pressure ulcer generation but are outside the scope of this paper.

Pressure

Weight-bearing pressure is applied to body tissue any time a person is supported by a surface – while lying down, sitting, or standing upright. For a seated person, peak pressure loads will almost always be concentrated near the ischial tuberosities, greater trochanters, coccyx, and sacrum.

The most widely accepted interpretation of pressure ulcer formation relies on pressure producing ischemia which deprives cells of oxygen and nutrients. Over time, this causes tissue cells to die. Related theories implicate ischemia and reperfusion, impaired interstitial fluid flow, and lymphatic drainage. Ischemia and ischemia-related events are certainly important but may not be the sole or even primary cause of tissue death.

Pressure is commonly managed with cushioning and contouring techniques designed to equalize pressure or to redistribute peak pressures away from bony prominences and onto other areas of the body that can tolerate the forces.

Microclimate

The microclimate factor refers to moisture and temperature conditions surrounding the area of the body being supported. Moisture contributes to pressure ulcer generation in at least three ways; it decreases the strength of the stratum corneum (outer most layer of the dermis), can cause irritation, and increases the Coefficient of Friction (CoF) at each of the various layers of contact materials including the skin, clothing, and support surfaces. This is important because a higher CoF leads to higher shear load potential. A temperature increase in the local tissue will raise the metabolic rate resulting in a greater demand for nutrients and oxygen and produces a greater volume of metabolic waste. The increased metabolic rate can expedite ischemic conditions if sufficient perfusion capacity is not available.
Microclimate conditions may be mitigated by any measure which allows for ventilation to keep the surface of the skin, clothing and support surfaces dry and reduces the insulating, temperature increasing, impact of support cushioning.

Shear

Shear loads, and potential for skin trauma, are caused by two phenomena working in combination: pressure and friction (from a tangential force). Shear is the distortion or deformation of a body by two oppositely directed parallel forces (tangential force). Tissue trauma can occur with two mechanisms: Shear stress augments the ischemic effect of pressure (like kinking a hose), and shear strains fracture or tear biological micro structures.

Shear can be managed. First, the pressure factor must be well managed – this is usually standard practice. Secondly, seating interventions which reduce the tendency to slide provide some additional opportunities to manage shear. Reducing the tendency to slide can be accomplished by positioning the sitter with a horizontal or inclined thigh angle and upright back alignment, by using componentry such as knee blocks and other support features, or by using a tilted back orientation in space. These two methods are already current practice methods for addressing seating issues related to weight bearing force management, postural alignment and function.

Another way to manage shear is to use a low friction interface, but a few variables must first be discussed; Friction, the Coefficient of Friction (CoF) and the Limiting Friction load (LFL).

- Friction forces act parallel (or tangential) to the skin surface and produce shear stresses and strains within the skin and underlying tissue. Friction is the force resisting one surface from sliding across another surface (two surfaces in contact with each other). Friction is the force resisting both sliding (dynamic) and the "tendency to slide" (static). It is understood that the a person sliding down in their seat or on a bed is undesirable, but it is important to also realize that damaging friction/shear loads can, and often do, exist without ongoing sliding motion on the wheelchair seat or in the bed.
- The Coefficient of Friction (CoF), a way to quantify how easily one material will slide against another, is the ratio of the friction force between two materials and the force pressing the two materials together. The CoF is an important variable since it is one of the factors which determines something called the Limiting Friction Load (LFL). The other factor is pressure. Moisture in the area will lead to higher CoF between most materials, leading to an even higher shear load potential.
- The Limiting Friction Load (LFL), also understood to be the "threshold of motion", is important because it is where the shear load peaks. Similarly to lowering peak pressures, peak shear loads can be reduced by using material combinations having a low CoF in one of the layers in the weight bearing area (e.g.; skin / underwear, underwear / outerwear, outerwear / cushion cover, cushion cover / cushion) to reduce the "grip" friction has on the skin and surrounding clothing. It is very common to associate friction and shear damage with sliding and not realize that one way to avoid high, damaging friction forces is to allow/facilitate at-risk skin to slide easily.

A low friction interface provides this function. However, there is an important consideration: if the entire support surface is low friction (slippery), the stability provided by "non-harmful" friction can be lost. Shear force can be reduced without sacrificing stability by targeting the low friction area to only areas which are at risk of or are experiencing trauma.

Conclusion

Pressure ulcers present a health threat to regular users of wheelchairs. Ulcers are a current problem for more than 65,000 wheelchair users and cost our healthcare system more than $2.8 billion annually. Pressure cannot be ignored as a contributing cause of decubitus ulcers, but research strongly suggests it is only part of the picture. One other part of that picture is shear loading. Practitioners should actively consider methods to reduce shear from the body/seat interface.

References are available upon request.

IC54: Creativity: Does It Still Have a Place in Rehab?

Kathryn J. Fisher, B.Sc. (OT), ATP
Lisa Rotelli
Nicole Laprade, M.Sc. (OT)

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify at least three dynamic positioning technologies for both manual and power wheelchairs and understand clinical reasons for choosing each.
2. Determine the benefits of a full physical and functional assessment order to select appropriate driver control and access methods.
3. Explain how proper education to clients ensures effective use of their technology for long-term physical and functional benefits.

Can there still be a place for creativity in developing assistive technology and mobility systems for our clients? Complex integration of driver controls and communication systems allows our most involved clients (both adult and pediatric) opportunities for independence. This presentation will illustrate a variety of creative solutions using case studies and hands-on equipment trials. Discussion will focus on a problem solving, creative approach to equipment selection, client/caregiver education and training and justification for funding.

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IC55: Get Smart with SMA: Positioning & Power Mobility Set-Ups for Clients with Spinal Muscular Atrophy

Nicole S. Wilkins, OT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify one potential solution for seated postural support with a client with SMA.
2. Identify one potential solution for power mobility set-up with a client with SMA.
3. Identify one method for controlling the mouse or an electronic aide to daily living through the power wheelchair.

Several interesting video case studies will illustrate a variety of clients with spinal muscular atrophy. The progressive and weakening nature of this disease presents a unique set of challenges for these clients, therapists and vendors. Positioning options will be presented that balance the need for support and function. Power mobility solutions will be shared as well as their unique set-ups for controlling seating functions, on/off, drive speeds, mouse control and electronic aides to daily living.

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PS7.1: Relationships Between Wheelchair Skills Tests and Propulsion Kinetics

Lauren Rosen, PT, MPT, MSMS, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify the two kinetics wheeling parameters measured by the SmartWheel that are significantly related to wheelchair skill.
2. Determine what assessment or treatment protocol (kinetic parameters or skills) is appropriate for specific testing objectives.
3. Identify the two surfaces on which kinetic wheeling parameters are predictive of wheelchair skills.

Two well-published measures to assess wheelchair function are the Wheelchair Skills Test (WST) and the SmartWheel Clinical Protocol (SCP). However, no work has described their relationship with each other. The objective of this study was to assess this relationship. We found that self-selected wheeling speed and average distance per push on ramp and self-selected wheeling speed on carpet significantly predicted wheelchair skills in adult populations.

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PS7.2: Effects of Wheelchair Type & Task on Mobility Performance: Speed and Collisions

Helen M. Hoenig, MD, MPH
Kevin Caves

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Name two measures used to describe wheeled mobility performance.
2. Describe differences in performance between mobility devices.
3. Describe performance difference between tasks.

Speed and collisions are sensitive measures to detect device-specific and setting-specific effects on outcomes.

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PS7.3: Effects of Wheelchair Configuration on Manual Wheelchair Propulsion Training

Ian M. Rice, PhD, MOT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Compare three aspects of a non-optimally configured manual wheelchair to an optimally configured wheelchair and show the similarities and differences between the two settings.
2. Measure inter-stroke variability propulsion characteristics to classify a client's skill level.
3. Correct a non-optimally configured wheelchair to promote optimal learning conditions.

The main objective of this pilot study was to determine if novice, able-bodied subjects show more pronounced positive changes in manual wheelchair propulsion technique after training if they are using an optimally configured manual wheelchair compared to those receiving the same training while using a non-optimal wheelchair configuration (e.g. out of box configuration). Results thus far indicate that proper configuration both improves propulsion technique without training and allows individuals to benefit more from training.

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PS7.4: Procedures for Identifying and Managing Wheelchair and Seating Repairs

Ryan D. Crosby, ATP
Joan Padgitt, PT, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify three key components of wheelchairs and seating that when left unattended can lead to costly wheelchair repairs or medical treatments.
2. Identify five simple wheelchair and seating adjustments they can make to help prevent more costly repair issues.
3. List logical steps to troubleshoot typical repair problems and the correct type of intervention necessary for the end user to be fully successful in their mobility related activities of daily living.

Many minor repairs to wheelchairs and seating are overlooked by medical professionals. Neglecting the simple things can lead to very costly repairs or may significantly impact the operator's health and safety. Identifying and handling these issues early can prevent unnecessary repairs and medical procedures as a result.

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IC56: Put Me In, Coach, I'm Ready!

Jacqueline Black, MSPT
Randy Potter, ATP, SMS

Learning Objectives

At the end of this session, the participant will be able to:

1. Identify the reasons for teaching wheelchair skills to wheelchair users and their caregivers.
2. Recognize the value of an intake form for clients enrolled in a wheelchair skills program.
3. Apply concepts of motor control and motor learning to wheelchair skills training.
4. Describe the appropriate progression of manual wheelchair skills, based on Kirby's Wheelchair Skills Training Program (WSTP).
5. Critically analyze current process for addressing wheelchair skills education and training.

In most extracurricular activities, there is a coach that encourages, instructs, and supports you in that particular activity. In this session, we would like to advocate for the wheelchair user by discussing the importance of teaching and coaching wheelchair skills. This session will focus on the current research, clinical concepts, and programming examples regarding the teaching of manual wheelchair skills.

Research has provided us with excellent information regarding the advantages of a wheelchair skills program. Relationships exist between manual wheelchair performance and participation (1), as well as wheelchair performance and return to work (2). We, at the VA Eastern Colorado Health Care System, were given the opportunity to utilize this information in our wheelchair program and would like to share information regarding the development of our wheelchair skills program.

The World Health Organization states that the objective of good practice and training is to ensure that all users are given the information and training they need to be able to use their wheelchair safely and effectively (3). How do you provide this information and training to your clients that rely on their wheelchair for home and/or community mobility?

Lee Kirby provides an excellent, comprehensive guide in the Wheelchair Skills Training Program (WSTP). (4) It is recommended that all persons involved in wheelchair skills training review this WSTP manual, as it provides research and evidence regarding the training and efficacy of wheelchair skills training, detailed information regarding the teaching of specific wheelchair skills to end users and/or caregivers, and resources available for use in a WSTP.

How do you define wheelchair skills? What are the goals of wheelchair skills? This is an area that our team members regularly discuss as we continue to revise and enhance our skills program. Kirby summarizes a main goal of wheelchair skills as increasing the likelihood that a wheelchair user or caregiver who needs and wants to improve his/her ability to safely and effectively use a wheelchair will have an opportunity to do so. Kirby also outlines the benefits of wheelchair skills, including fewer acute and overuse injuries, improved sense of wellbeing, improved development and FUN! We have also observed improved confidence in our end-users and caregivers, as well as a decrease in equipment abandonment and increase in the intended use of the device.

Many clinicians may be concerned "finding the time" and "fitting it all in", especially given the current limitations with acute rehabilitation after traumatic injuries. Clinicians are required to balance numerous clinical goals to prepare their clients for discharge, as quickly and efficiently as possible. Not only are clinicians teaching numerous strategies for a variety of tasks in a short amount of time, but they are also challenged to incorporate more technologies into rehabilitation, such as gait/ locomotor activities. Despite our concerns with time, current research shows that wheelchair skills training shows significant improvements in wheelchair skills performance after just 3-6 sessions, for a total of 2-5 hours (5,6).

When teaching wheelchair skills, it is important to review principles and current research regarding motor control and motor learning. Kirby provides a review of this information in his WSTP manual. Clinicians also need to consider aspects of motor control and motor learning including feedback (intrinsic and extrinsic), massed vs. distributed practice, variable practice, whole vs. part training, transfer of training (to new task or environment). (7)

Another review of studies on motor control discusses the effects of attentional focus, self-control, and dyad training on motor learning (8). Review of the research in this article shows that learning was more effective when performers were given external focus instructions and external feedback. This review also suggests the effectiveness of giving learners control over their practice sessions, including the learner deciding when and how much feedback is provided and the scheduling of practice sessions. Finally, this review also supports the benefits of group vs. individualized training sessions, as observational learning has been shown to be an effective means of teaching motor skills. All of these principles and research regarding motor learning and motor control should be considered with respect to wheelchair skills training.

We treat veterans with a wide range of ages, diagnoses, home and community environments. We have learned that the use of a wheelchair skills intake form is essential to the successes of an individualized wheelchair skills training program. All manual wheelchair users can benefit from some level of wheelchair skills training, whether they propel their wheelchair independently with the upper extremities, propel their wheelchair via hemi-propulsion, or if they are dependent in their manual wheelchair mobility. The intake form allows us to focus on the specific, unique needs of the end user Kirby provides a list of skills for both manual and power wheelchair users and caregivers. (4) He also provides an extensive description of each skill, including the rationale for each skill and detailed training tips for each skill. As we review these skills outlined by Kirby, we will also discuss how we incorporate these skills into our equipment education and training programs. We also emphasize the importance of teaching proper wheelchair propulsion techniques (9) in our skills programming. We often utilize the SmartWheel for our assessments and teaching of proper propulsion. The SmartWheel data provides us with further objective information regarding propulsion and biofeedback for the client. Kirby also outlines the roles and responsibilities of trainers and spotters, and we will discuss how we have integrated these roles into our skills program.

We will also summarize the results of an informal site survey that was sent to other rehabilitation facilities. This information will provide the participant with additional perspectives regarding education and training of wheelchair skills. Our closing statements will include our program's philosophy of skills, which is the end-user living their life to the fullest. We must truly understand how the person defines living life, and we must truly understand how the prescription of equipment, fitting of equipment, training on equipment and skills, and reassessment of equipment and skills- how each of these areas work together in supporting our clients to live their life!

Finally, we will have 10 minutes at the close of the session to allow participants to trial roles of the end-user, trainer, and spotter.

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IC57: Pediatric Manual Mobility - Seating Children for Function

Lauren Rosen, PT, MPT, MSMS, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Describe current limitations to proper pediatric equipment selection.
2. List three reasons why proper equipment provision affects a child throughout his or her lifespan.
3. List three features of a properly prescribed pediatric manual wheelchair.

This course will focus on proper wheelchair selection and set-up to maximize function, improve self-esteem and allow kids to be kids. This course will focus on the common trends seen in pediatric manual wheelchairs and discuss why they are not always in the best interest of the children. Videos of children propelling wheelchairs, SmartWheel Data, and published research will be used to explain the concepts and to help the participant to understand how manual wheelchair can be prescribed better for children.

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IC58: Comparing the Tongue Drive System to Standard Methods of Control via Assistive Technology

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Diane Rowles
Elliot Roth
Ann Laumann
Joy Bruce
Jeonghee Kim
Xueliang Huo
Emir Veledar
Maysam Ghovanloo

Assistive technologies are critical tools to assist individuals with severe disabilities to control their environment, carry out activities of daily living, and perform independent mobility. Many available assistive devices are controlled by switches, tracking of eye movement, or through brain computer interfaces. Traditional switch systems provide limited degrees of freedom, require consistent positioning in proximity to the switch, and have minimum strength, range of motion and endurance requirements. Systems that track eye movement can interfere with the users' normal visual activities, and brain computer interfaces are often invasive, slow, and/or costly. The tongue has many degrees of freedom, a low rate of perceived exertion, is often not affected by SCI, and is often the last to be affected by many neuromuscular degenerative disorders.

A new assistive neuro-technology, called the Tongue Drive System (TDS), a wearable and wireless assistive technology developed at the Georgia Institute of Technology, uses tongue motion to enable people with spinal cord injury (SCI) and other physical disabilities to control computers, smart phones, wheelchairs, and other aspects of their environment. From September 2009 through December 2011, the Georgia Institute of Technology sponsored a clinical study in collaboration with Shepherd Center, the Rehabilitation Institute of Chicago and Northwestern University. The primary objective of this study was to evaluate the TDS to assess the acceptability and usability for computer access, wheeled mobility, and environmental control.
The TDS system consists of a magnetic tracer which is attached to the tongue through adhesion or piercing. This tracer generates a magnetic field within and around the mouth that is detected by an array of magnetic sensors mounted on a wireless headset. Through this connection, changes in the magnetic field induced by tongue movement are sent wirelessly to a computer or Smartphone, which processes and translates the tongue motion to an assigned control function. These control functions can be used to operate a variety of devices, including computers, phones, and powered wheelchairs.

Participants in the trial were composed of 17 able-bodied people with existing tongue piercings, 21 able-bodied participants who underwent tongue piercing by physician investigators, and 11 participants with spinal cord injury and limitation in arm function who underwent tongue piercing. Participants in the trial completed 12 weekly testing sessions, alternating computer tasks of increasing difficulty with power wheelchair operation through an obstacle course. Able-bodied participants performance with the TDS system was compared with keyboard and mouse use. For participants with spinal cord injury, performance using the TDS was compared to sip-and-puff use.

Outcome measures for the computer portion of the trial were: average rate of successful message delivery (throughput), time to complete a task, and the number of errors during the completion of a task. Outcome measures for the wheelchair propulsion part of the task were: time to complete a task, the number of times the wheelchair left the obstacle course, the number of obstacles struck, and the number of emergency stops.

Results for the able-bodied participants demonstrated that improvements were made in task completion times for nearly all tasks, with the greatest improvements occurring from session 1 to session 2. After 3-5 sessions, maze navigation speeds using the TDS system were comparable to those using the keypad, but not the mouse. Results for participants with spinal cord injury demonstrated improvement in task completion time and task accuracy for nearly all tasks. Initially, performance was better using sip-and-puff. After 5-6 sessions, performance with the TDS was as good as or better than performance using sip-and puff. All subjects indicated a preference for the TDS over sip-and-puff technology by the end of the trial sessions. These findings establish TDS as a usable neuro-assistive technology and demonstrate the use of a tongue stud as an effective means of attaching a magnet for this technology.

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IC59: Frustrated with "funding issues" - Practical details of how to do something about it - A real world story

Diane Thomson, MS, OTR/L, ATP
Ann Eubank, LMSW, OTR/L, ATP, CAPS

Learning Objectives

1. The audience will be able to state three elements of consumer empowerment.
2. The audience will be able to identify two practical skills related to successful advocacy.
3. The audience will be able to state two elements of the service delivery process that they can influence.

This presentation will discuss the practical details of how to become a strong consumer advocate to bring positive policy change for increased access to seating and wheeled mobility choices. While consumer advocacy is heralded as a professional ethic, very little education focuses on the practicalities and details to enhance this area of practice. At the same time, third-party payers continue to deny consumers vital equipment that provides the opportunity to participate in their lives, basically dictating the health care professional's practice.

This presentation will examine real-world examples of how to incorporate advocacy into clinical practice, originating from the seating clinic, to local consumer organizations and support groups to professional organizations, then finally to Washington, DC. At each point in the process, obstacles and resources will be discussed candidly. The presentation will illustrate how to create the opportunity for consumer empowerment through education of the service delivery process and choice. The presentation will also identify specific and valuable skills and perspectives exemplified by successful advocates including information focusing on the development of advocacy skills.

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IC60: The Mat Assessment - Its Not All or Nothing

Stefanie Laurence, OT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. List four key elements in a mat assessment.
2. Describe how to modify a mat assessment for specific populations.
3. Discuss how mat assessment techniques can be utilized to achieve functional positioning on a day-to-day basis.

In today's world of healthcare and the pressure to do more in less time, the mat assessment is often viewed as a luxury. Yet, a hands-on assessment is the foundation for an effective equipment prescription. The methods may vary, but regardless of who your clients are or where you practice, the information gathered is an essential part of the decision-making process for product choice and set-up to achieve a functional outcome. Participants will be guided through the key elements of a mat assessment and how to apply to specific populations.

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IC61: Posture and How it Develops: Standing & Sitting Considerations for the Young Child

Sharon L. Pratt, PT
Clare Wright, OT, BSc

This workshop will review human posture and its development. From birth, we will review the developmental milestones as they relate to postural and functional development and from there review why standing and early sitting support is so critical. We will discuss the benefits of each as well as delve in to some of the commonly asked questions about standing and sitting for our younger children

Upon leaving this workshop; participants will be able to
1. Speak to “how posture develops”
2. Identify when sitting support is needed in the young child
3. List 3 benefits of standing
4. List 2 benefits of early sitting support

Posture

Human posture can be defined as, “the position of one or many body segments in relation to one another and their orientation in space” (Ham et al, p26). The head, trunk, pelvis, lower limbs and feet are known as body ‘segments’, while spinal joints, hips, knees, ankle and shoulder joints are considered the body ‘linkages’ (Pope 2002).

Human posture is influenced by a number of interconnected factors:
- muscle tone (i.e. high or low)
- body shape and size (i.e. height and weight)
- gravity
- the surface (e.g. uneven ground, slopes, sand, footwear)
- the task in hand
- length of time required to be in a particular posture
- level of health, well-being or emotional state

Therefore, posture can be seen as the inter-relation and inter-dependency between:
- comfort
- stability
- unction (including movement)

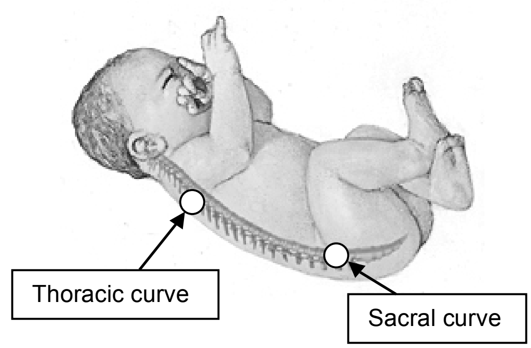
In the absence of stability, function (for example, the ability to play, use communication devices or do schoolwork) is impaired. However, stability can only be achieved with some degree of comfort. Function may be achieved in the absence of comfort or with minimal stability, but it will be short-lived. The balance must be struck between comfort, stability and function, depending on the task in hand and the environment. Therefore posture is important because it supports a vast range of daily functions, in addition to supporting internal processes such as breathing, vision, digestion, circulation, temperature regulation.

Humans need to be able to operate in a variety of environments, for a variety of reasons and hold themselves upright against gravity. When considering posture it should be seen as an active and dynamic process which underpins movement and function (Hong, 2005). Howe and Oldham (2001) also highlight that posture and movement are inextricably linked, referring to posture as a temporary arrested movement, which is in a constant state of change.

How posture develops

When babies are born they have a predominantly flexed (C-shaped) posture with two primary spinal curves known as the thoracic curve (mid back) and sacral curve (bottom) (Image 1).

Image 1



In the usual sequence of events, babies move through developmental stages almost seamlessly (Image 2).

Image 2

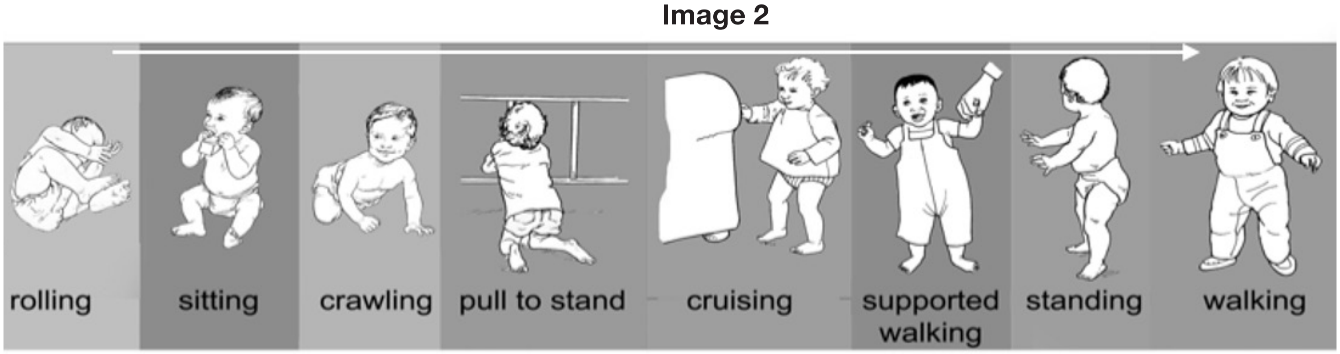
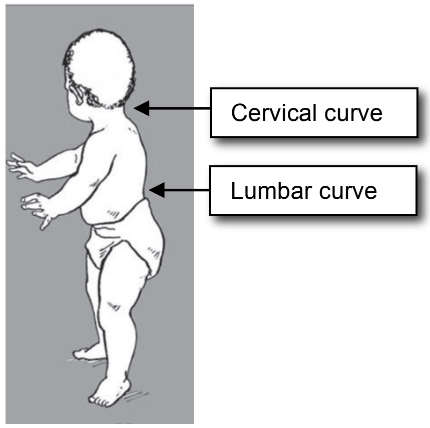


Image 3

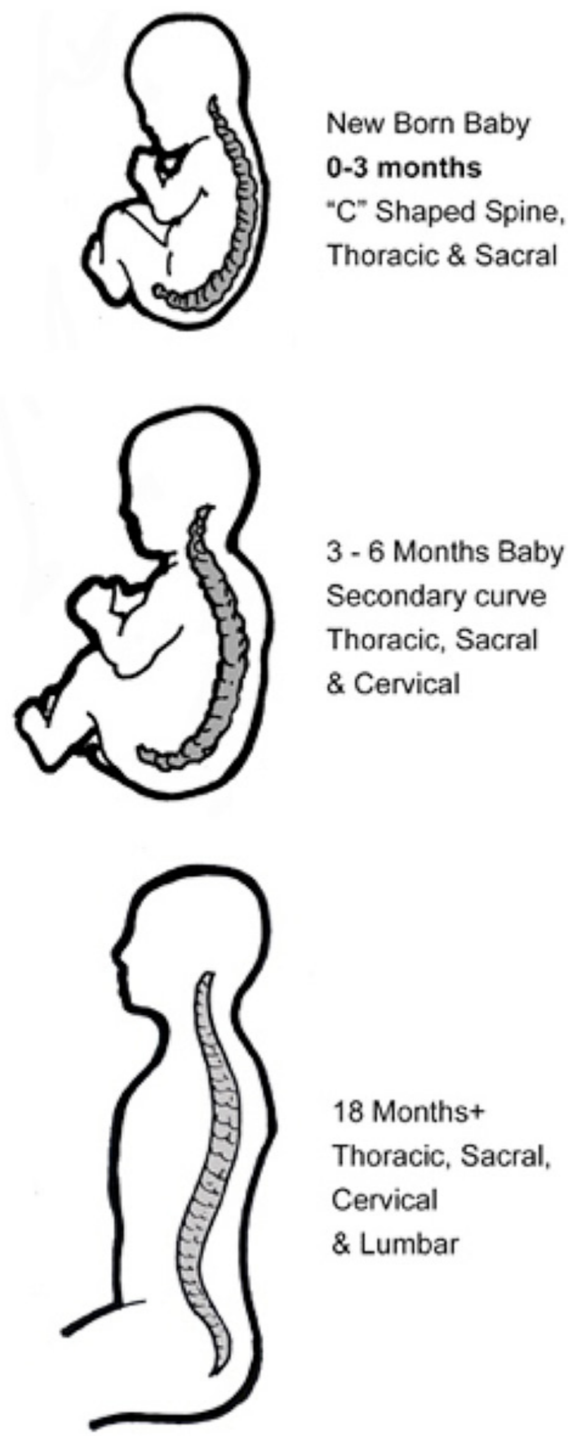


As they learn postural control against gravity their spines develop secondary extension curves in the cervical (neck) region first (holding their heads up against gravity when on their tummy or hands and knees) and lumbar region (lower back) as they gain sitting and standing balance (Image 3).

Postural control requires achieving normal developmental milestones and includes the maturing of postural reactions (righting, protective and equilibrium reactions), the integration of primitive reflexes (asymmetrical tonic neck reflex, symmetrical tonic neck reflex, tonic labyrinthine reflex), as well as normal muscle tone, normal postural tone and intentional voluntary movements (Wandel 2000).

Why supported sitting is important

If these curves do not develop as in Image 3 and do not exist unsupported, the body's center of balance is shifted, causing undue stress on the spinal column and spinal cord.



Adding age appropriate curves to seating systems dissipates the forces of gravity and facilitates the progression of developmental milestones.

Cervical curves happen with lifting of head in prone; thoracic curves happen with prone on elbows/arms; lumbar curves happen with true quadruped crawling.

Between 3 and 13 months of age infants undergo three periods of profound changes in perceptual, cognitive, and socio-emotional behavior. Findings from over two decades of research demonstrate that an infants' newly acquired ability to move independently through space is a powerful facilitator of a number of developments that occur during these times of behavioral reorganization.

The three significant times of mobility development:

- Between 3-4 months infants typically begin to reach
- Between 7-9 months they typically begin to creep
- Between 12-13 they typically begin to walk.

Locomotor experience facilitates psychological development.

With this in mind, we can ask ourselves when we should recommend positioning to be considered? Children should be allowed to meet recognized milestones, even if modified. Momentary, unstable sitting is usually achieved between 3 and 7 months so we should provide our children with effective support in sitting at equivalent age. Keeping in mind that positioning can be instrumental in facilitating reach, exploration of their world, (which in turn can enhance psychological development), we believe that early intervention in terms of positioning is critical for the seated child to have a functional posture upon reaching school age.

Why standing is important

Human beings are designed to stand. When development is unhindered, children start pulling themselves to a standing posture from as early as nine months old. This naturally progresses to cruising along furniture, then walking with hands held, to independent walking from approximately 12 months old. The ultimate goal is being able to move from one place to another at will, and achieve all the day-to-day play, self-care and school or work activities that are still to be learned. When development is seamless, we take this progression for granted, and don't stop to think how important the upright posture is.

However, when children have moderate to severe physical disabilities (for example, cerebral palsy, spina bifida, muscular dystrophy, developmental delay, osteogenesis imperfecta [brittle bones] or acquired injuries) which prevent them from weight bearing independently, this developmental progression may not take place or skills already gained may be lost. Independent standing or walking may not be achievable. Therefore developing or maintaining an upright posture using specially designed standing frames at an age appropriate time becomes highly important.

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IC62: Training Consumers for the skills of Wheelchair Transportation Safety

Mary Ellen Buning, PhD, OTR/L, ATP/SMS
Thaddeus Hazzard, ATP

Abstract

This presentation will illustrate the development of a unique training platform equipped with both a typical adjustable slope transit bus ramp and a wheelchair securement station. The idea of the platform was the result of collaboration among a therapist, supplier, local van modifier and researcher. The platform is able to support both teaching the skills of entering and exiting a city transit bus and increasing consumer knowledge to allow them direct others to properly secure their manual or power wheelchair--whether or not it has four WC19 securement points. The session will use a consumer empowerment approach and will also serve to educate therapists and suppliers when making decisions about recommending wheelchairs suitable for transportation purposes as well as addressing consumer transportation problems or questions.

Learning objectives

1. Recognize the value of a training platform that can be used to teach wheelchair securement skills within a specialty, seating clinic.
2. Know how to empower consumers by helping them recognize the elements of a properly secured wheelchair while sitting in one.
3. Respond with applied solutions to common problems encountered by consumers in both WC19 compliant and non-compliant wheelchairs.

Introduction

The topic of wheelchair transportation safety (WTS) is a relatively new consideration for many therapists and suppliers. Yet, these are the experts that consumers turn to for education, comprehensive mobility device assessment, assistance for justification of medically necessary wheelchair features and for delivery and service of a funded mobility device.

Since the goal of a wheelchair seating and mobility assessment is to maximize participation and choices in the least restrictive environment, transportation to community locations for health care, employment shopping and participation should ALWAYS be an essential consideration.

Consumers have a right to expect “best practice” from their seating and mobility professionals. The essential elements of professional AT practice are to “do no harm” and to “maintain a level of professional competence” in providing services directly to consumers.

The Training Platform

The project began with Thaddeus “TD” Hazzard, ATP, who developed a training tool for his customers. He had noted during home visits, that his customers were very unsure of themselves on ramps, especially when descending. He had also noticed that ramps built to give home access to new wheelchairs users were often more steep than the 1:12 rise to run slope specified in the ADA. His customers were also unable to visualize the amount of clearance they needed to pass under a header such as through a van door opening. His prototype was intended to address these issues. He brought his tool to the Wheelchair Seating and Mobility Clinic at Frazier Rehab Institute (FRI) in the spring 2012 for feedback. His training platform included a dual height ramp. The clinic therapists had previously given technical assistance to clients, researchers and public transit providers on issues of WTS, and especially for ingress and egress. So, with feedback from the therapists, TD’s original idea grew to include another type of ramp--one like those deployed on public transit buses to allow wheelchair users to board.

The clinic already had a wheelchair securement platform (Q’Straint). It was stored under a mat table and used as needed to train consumers, residents, community therapists, vocational rehabilitation and certified driver rehabilitation specialists on wheelchair securement and occupant restraint for WTS. The idea for a ramp-training platform then began to grow into one that would also include the wheelchair securement platform.

The local NMEDA-Certified van modifier, Superior Van and Mobility, is very active in educating newly disabled patients being discharged from FRI. Their education specialist, Paul Erway, recognized the value of the project being discussed and suggested inviting a company’s technician to discuss the feasibility of the concept. A list of requirements was developed that included:

- Able to include the 4’ x 7’, 4-point tiedown training platform without being much larger.
- The ability to produce ramp slopes of 1:12, 1:6 and even the improperly deployed bus ramp slope of 1:4 *
- Portability for moving between hospital floors for use in patient education and training.
- Storability for placement out of foot traffic so as not to clutter clinic floor space. This meant storage under a mat table with a clearance of 18”.
- Ease of use for therapists so it could be used without technical support.
- Be designed for safe use with a 500+ lb. load (300 lb. W/C + 200 lb. client)
- Ramp dimensions were identical to those on a fixed route public transit bus.

The technician, Charlie Hall, reviewed the requirements and then used his ingenuity to develop the device pictured in Fig 1. and demonstrated in today’s presentation.

- The worst case scenario of 1:4 ramp was selected because of prior research that had identified bus ingress and egress wheelchair user incidents and reports of ramps improperly deployed without “kneeling” the bus or deploying the ramp to the sidewalk curb, thus greatly increasing the slope angle.

The training ramp has been rolled out of its storage place underneath a mat table. The platform elevates with a small electric motor allowing the ramp to assume several slopes. The top surface is a Q'Straint training platform with adjustable, WC18 compliant securement straps and hook end fittings.

Not all patients need training or WTS training as part of a wheelchair seating and mobility assessment. However, the platform is easy to deploy when needed for transportation planning, preparation for public transportation, or securement in a personally owned van. Hospital staff can also use the platform for ramp training. The ramp can tilt onto its narrow dimension and roll down the hall and into an elevator.

Training Consumers in Securing their Wheelchair

Much has been written about the wide range of competence among those who transport wheelchair-seated passengers. Fixed route bus drivers may infrequently encounter wheelchair-seated passengers on their routes. The training these bus operators received may or may not include accurate or complete information. Testimony in legal cases has often shown that inadequate bus operator training is associated with passenger injuries. Errors frequently occur when entering & exiting the bus (K Frost, Bertocci, & Sison, 2010; K Frost & Bertocci, 2007; K L Frost, 2010; K L Frost, van Roosmalen, Bertocci, & Cross, 2012).

The person using the wheelchair is the common element in all situations requiring awareness of WTS. Consumers who are empowered with knowledge are better able to advocate for their needs and ask the driver to use wheelchair tiedown and occupant restraint systems (WTORS) (M. E. Buning, Getchell, Bertocci, & Fitzgerald, 2007) The ADA mandates buses to be equipped with WTORS but does NOT mandate that they be used. Local transportation policies vary widely. So, the informed traveler or family member is an essential part of WTS. No Federal regulation requires the use of an occupant restraint for a wheelchair seated passenger even though seat belts and child safety seat laws exist in every state. There is even significant variation among school bus transportation districts. It is negligent to wait until enough deaths occur to mandate the use of WTORS for wheelchair-seated passengers.

WC19 Compliant Wheelchairs
These wheelchairs are designed and labeled according to the standard and have passed a severe crash test simulating a 30mph, 20g frontal impact. This level of impact testing matches that used by federal safety standards to test passenger vehicles and child safety seats. While a WC19 wheelchair does not guarantee protection from injuries in a crash, it is the best protection possible for a wheelchair-seated passenger. It includes these features:

- Four permanently labeled, easily accessible securement-point brackets with specific geometry that allows for one-hand attachment of one or two tiedown hooks from tiedown-strap assemblies by a driver or caregiver reaching from one side of the wheelchair,
- A base frame and seating system that, along with the four securement points, have been successfully crash tested in a 30-mph, 20-g frontal impact when loaded by an appropriate-size crash-test dummy with the wheelchair secured facing forward by a surrogate four-point, strap-type tiedown,
- Tiedown-strap clear paths between the securement points on the wheelchair and typical anchor points on the vehicle floor, such that tiedown straps will not be in close proximity to sharp edges that could cause failure of webbing material when loaded in a frontal crash,
- Anchor points that enable the wheelchair occupant to use a wheelchair-anchored pelvic belt restraint to which the lower end of a vehicle-anchored shoulder belt can be readily connected near the occupant's hip,
- A manufacturer-disclosed rating of acceptable, good, or excellent for the wheelchair's accommodation of properly using and positioning a vehicle-anchored belt restraint,
- A measure of wheelchair lateral stability when secured facing forward by a four-point, strap-type tiedown,
- Reduced sharp points/edges that could cut belt restraints or injure passengers, and
- Use gel batteries and provide for retention of batteries and motors (M E Buning et al., 2012)

ISO 7176-19 Compliant Wheelchairs
This wheelchair standard is similar but less stringent and is accepted for use in Europe and elsewhere where concern for environmental accessibility is not mandated. A WC19 wheelchair exceeds the requirement of this ISO standard but the reverse is not true. It varies from WC19 in these features Does not require the wheelchair to be crash tested with a crash-test dummy restrained by a wheelchair-anchored pelvic belt restraint. Greater performance and strength in the wheelchair frame is needed to withstand pelvic belt restraint loading.

- Does not require securement-point geometry that facilities one-hand attachment of hook-type tiedown strap end-fittings
- Does not require testing of tiedown clear paths and securement-point accessibility, and
- Does not require testing to measure wheelchair lateral stability when the wheelchair is secured by a four-point, strap-type tiedown.

Standard Manual Wheelchairs
This manual wheelchair is available with sling upholstery in standard and lightweight versions. Use all four securement straps attached to welded joints on the wheelchair frame. Three-point, lap/shoulder occupant belt restraints do not make proper contact with the passenger's body because the armrest is closed. Do your best to have the belt make contact with skeletal body segments and attempt to prevent the passenger from submarining (sliding under the pelvic portion of the seat belt) upon sudden stop.

Ultralight Manual Wheelchairs
Most clients who use these wheelchairs have the ability to transfer from their wheelchair to a vehicle seat. Few manufacturers offer ultralight wheelchairs in crash-tested models. This is a real concern for an individual using power assist wheels because of upper extremity weakness. These individuals may need to use their wheelchair as a seat in a motor vehicle. A box-style frame may offer better performance in a crash as the additional frame weight can be off set by the power assist wheels.

Standard Power Wheelchairs and Scooters or Power Operated Vehicles
The most common type of power wheelchair, funded by Medicare and other health insurance for "in the home" mobility. These are classified as Group 1 and 2 power chairs or POVs. Use any accessible part of the frame for attachment of strap-type wheelchair securement straps. If the frame does not permit attachment, purchase WC18-compliant crash-tested securement straps and distribute to clients. Scooters are very dangerous when used as seats in motor vehicles due to high center of mass, narrow wheelbase, seat placement atop a post, and the presence of the tiller. Securement points, if available, are very low on the scooter base and do not allow proper tensioning of securement straps.

Custom Power Wheelchairs
The individuals most likely to be unable to transfer to a vehicle seat will be using these Group III power wheelchairs. Because of complex needs, they are often provided with specialty seating components and support surfaces, specialty controls, lap trays, communication devices, etc. These wheelchairs are most likely to be available in WC19 and ISO compliant versions. Manufactures have always limited the designation of WC19 compliance to power wheelchairs bases that are provided with their own off-the-shelf seating systems. New RESNA Volume 4 standards now allow for pairing WC19 frames with WC20 seating components which finally creates the possibility of a transit ready wheelchair with customized seating. Referring to the document Guidelines for Use of Secondary Postural Support Devices by Wheelchair Users During Travel in Motor Vehicles will help when making decisions about use of anterior chest supports, head supports, lateral trunk supports, etc.

Additional Learning Resources

This website contains many more resources for educating yourself and others about WTC: the RERC on WTS – http://www.rercwts.org/

- Standards - http://www.rercwts.org/RERC_WTS2_KT/RERC_WTS2_KT_Stand/Standards.html
- Frequently Asked Questions - http://www.rercwts.org/RERC_WTS2_FAQ/RERC_WTS_FAQ.html
- Educational Tools - http://www.rercwts.org/RERC_WTS2_FAQ/RERC_WTS_FAQ.html

The Ride Safe Brochure in English and Spanish – http://www.travelsafer.org/

YouTube - http://www.youtube.com/user/RERCWTS?feature=watch

FaceBook - https://www.facebook.com/pages/RERC-on-Wheelchair-Transportation-Safety/127831460927?ref=ts&fref=ts

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PS8.1: A modification of the Functional Mobility Assessment for use with school children in Kenya

Karen Rispin
Richard Schein
Joy Wee

Background

Feedback from users of assistive devices is essential to enable evidence based practice. Device users are in the best position to meaningfully evaluate the functioning of their devices as it relates to several International Classification of Function (ICF) categories [1]. Patient reported outcomes measures (PRO) - questionnaires designed and validated for the purpose of assessment of the subject/patient's well-being - are increasingly seen as key in the assessment of medical interventions of any kind, along with frameworks being developed for appropriate use [2, 3]. Feedback from users of wheelchairs and other mobility devices is essential to the development of more functional devices. The Functional Mobility Assessment (FMA) is a brief and well validated PRO for adult users of wheeled mobility devices [4, 5].
T
he development or modification of PROs for the pediatric population provides a unique challenge because a child's ability to respond to questionnaires differs from that of an adult [6, 7]. Caregivers have often been asked to complete questionnaires on behalf of younger children unable to read well or respond in an adult manner [8]. One tool utilized in questionnaires designed for children is a Visual Analogue Scale (VAS) with anchors that include emoticons [9]. There are indications that even very young children can respond in a valid meaningful way through the use of such emoticons or anchors on a visual analogue scale format [8, 9].

Sensitivity to detect differences is a necessary attribute of effective PRO metrics [10]. An additional benefit of the VAS format is increased sensitivity, as VAS format questionnaires often produce continuous parametrically normal data enabling the use of more sensitive parametric statistical analysis methods [11]. Many pediatric PROs include methods of collecting input from caregivers as well as from pediatric subjects though there are indications these two sources of feedback may not always perfectly agree [7, 12]. Because children often have better listening skills than reading comprehension, questionnaires are often done in an oral as well as written format[9]. Cognitive interviewing methodology can reveal and ameliorate any lack of understanding on the part of a child [6].

Questionnaires are often tested for reliability using test/re-test study design analyzed by calculating intra-class correlation coefficients [5]. For pediatric questionnaires, ICC values of 0.41-0.61 have been designated poor to fair agreement; 0.61 – 0.80 good or excellent agreement; and 0.81 – 1.00 excellent agreement [8, 13]

We could not find any validated and reliable PRO enabling wheelchair evaluation for a pediatric population. To meet this need, investigators have made a preliminary modification of the FMA for pediatric use. The objective of this study was to test that modification for test/re-test reliability in a school aged pediatric population of wheelchair users in Africa.

Methods

Investigators have devised a version of the FMA modified for use by school children and their caregivers. Because the questions are simple and straightforward, the text has not been changed. Question format has been modified for pediatric use with VAS format with emoticons at each end, with "grades" acting as "anchors." Investigators chose to use emoticons because these are often utilized in VAS for children and chose to augment these with letter "grades" because school aged children are almost universally familiar to the concept of "grades" or academic scores which are essentially a rating system for school work[9].

Our protocol for the FMA modified for children includes both oral and written formats of this questionnaire: A researcher sits with the child and the child's caregiver; the participant is given the chance to read the question; the question is then read aloud by the researcher; and then the subject, caregiver and researcher will discuss the question and interview the child to facilitate comprehension and to determine if the child is fully understanding the question. Researcher and caregiver are instructed to take great care not to "lead" the child in any way. An oral spoken response and explanation is sought from the child, and the child is asked to "grade" the specific item on the VAS. The subject's comments are thus solicited and recorded. Both the caregiver and researcher are required to gauge whether the child had understood and meaningfully responded. If not, the caregiver listens to and interacts with the child again, and then indicates a meaningful response on the VAS for that question. The data collection sheet includes a line for a comment from the subject and another line for a comment from the caregiver.

Subjects wheelchair users attending a boarding school for children with special needs in Kenya where children with special needs are generally not able to attend main stream classes. Such children may begin school quite late because their parents may not initially know of special needs boarding schools. English is the spoken language in school and the questionnaire was administered in English though the questions were also translated into other languages the subject was familiar with as part of the cognitive interview.

The children and their caregivers completed the questionnaire once, and then completed it again one week later. Researchers for the test-retest reliability study were undergraduate students who had received a briefing, read the protocol, observed the PI administering the FMA in this format to a subject and caregiver, and then administered the FMA to a subject and caregiver under supervision.

As with other 100 mm-VAS format questionnaires, the distance between the left hand end of the line and the vertical mark made by the subject was measured using a millimeter ruler with each question will produce a score between 0 and 100 for each subject. The data was tested for normalcy using the Shapiro Wilks test. Intra-class correlation coefficients

(ICC) for the data for each question from the two sessions were calculated to ascertain test-retest reliability.
Results

Investigators completed test-retest reliability testing for this format of the FMA with a cohort of 44 school children who were full time manual wheelchair users (Age 13 ± 3.2). Three subjects were in classes for academically challenged children, the others were in normal academic curriculum spread quite evenly from kindergarten to grade eight. Their disabilities included nine different diagnoses, the three most common being cerebral palsy (40%), spina bifida (17%) and muscular dystrophy (17%).

Among the ten items in the questionnaire, eight of the items had ICC values greater than 0.6 while one item, Item 3 – 'Health Needs', had an ICC value of 0.47 (Table 1). The ICC value for item 10-'Transportation' was not calculated because over 60% of the subjects had never experienced traveling in vehicles with their wheelchairs.

Table 1. Intra-class correlation coefficients values for the test-retest results of the FMA questions modified for use by school aged children.

Item	ICC average measures values (Confidence Interval)
1. My current wheelchair allows me to carry out my daily routine: (tasks I need to do, am required to do)	0.86 (0.74 - 0.92)
2. My current wheelchair meets my comfort needs: (heat/moisture, sitting tolerance, pain, stability)	0.66 (0.37 - 0.81)
3. My current wheelchair meets my health needs: (pressures sores, other injury, breathing)	0.47 (0.03 - 0.71)
4. My current wheelchair allows me to operate it as independently and safely as possible: (do what I want to do when and where I want to do it)	0.73 (0.51 - 0.85)
5. My current wheelchair allows me to reach and carry out tasks at different surface heights: (table, bed, chair)	0.67 (0.40 - 0.82)
6. My current wheelchair allows me to transfer from one surface to another: (bed, toilet, chair)	0.80 (0.61 - 0.89)
7. My current wheelchair allows me to carry out personal care tasks: (dressing, eating, washing, toilet care)	0.70 (0.44 - 0.83)
8. My current wheelchair allows me to get around indoors: (bedroom, schoolroom, at home, shops)	0.74 (0.52 - 0.86)
9. My current wheelchair allows me to get around outdoors: (uneven surfaces, dirt, gravel, ramps, obstacles)	0.68 (0.42 - 0.83)
10. My current wheelchair allows me to travel in vehicles efficiently such as cars, buses, taxis: (load wheelchair)	N/A: Many children had never traveled with their chair

Discussion

The results of this study indicate that our protocol for this modification of the Functional Mobility Assessment provided a reliable tool for use with school aged wheelchair users. Eight out of the ten FMA items had good to excellent agreement whereby one items, health needs, had moderate agreement. This was the case even though our subjects did not speak English as their first language. Further validation with subjects who speak English as a first language may indicate even stronger reliability. With further validation, this version of the FMA could provide a much needed tool for those looking for a patient reported outcomes measure for pediatric wheelchair users.

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PS8.2: Implementing the FEW into Everyday Best Practices

Michael Bender, OTR/L, ATP, CDRS
Sue Tucker

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify the purpose of the Functioning Everyday with a Wheelchair (FEW) assessment tool.
2. Identify how to incorporate the FEW into the rehabilitation technology supplier's ongoing QI-PI process.
3. Identify how the FEW can enhance end user outcomes.

The Functioning Everyday with a Wheelchair (FEW) is a self-report questionnaire that can be administered over time to create a profile of perceived user function. The ease of administration allows the FEW to be utilized during the initial seating and mobility evaluation, after initial fitting, and as a follow up to specified intervals of time in the future. The data collected from the FEW allows the rehabilitation technology supplier a tool to meet their accreditation-required QI-PI program on an ongoing basis. http://www.few.pitt.edu

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PS8.3: Functional Mobility Outcomes of Individuals Receiving a New Seating Device

Renee M. Brown, PT, PhD
Stacey Lindsley, SPT

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. List three reasons why it is important to assess functional outcomes of wheelchair users.
2. Identify the criteria assessed in the Functional Mobility Assessment.
3. List three outcomes of this study related to patients' reported functioning with their seating and mobility devices.

Determining the functional outcomes of individuals prescribed new seating and mobility devices is important for understanding function and for justification for reimbursement. Our study examined patients' reported level of functioning before and after receiving a new seating or mobility device using the Functional Mobility Assessment (FMA). Overall, subjects reported a higher level of functioning with their new seating/mobility devices with the greatest improvement being in their reported comfort level. Additionally, access to public and private transportation is an issue for full time wheelchair users and will be addressed.

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PS8.4: Translation of the Functional Mobility Assessment into Portuguese for Brazilian Health Professionals

Alessandra Cavalcanti, OT

This paper presents the initial phase of the process of translation and validation of the 'Functional Mobility Assessment – FMA in Brazil. The translation was done by researchers from the Laboratory Integrated Assistive Technology (LITA / UFTM) of the Federal University of Triangulo Mineiro (UFTM).). In 2010, after being authorized by the authors of the original questionnaire, FMA was translated into Portuguese in an independent manner as part of the first stage of the process of translation and validation of that instrument. Two translators from Brazil, with proficiency in English language, translated the FMA. Each one of the translators translated the FMA. Therefore, there were two versions of the FMA translated (T1 and T2). The two translations (T1 and T2) were synthesized in a single T3 (T1 + T2). The single version (T3) was then given to other two translators. At this phase of the process, the translators were English speakers, Portuguese was their second language, and they were responsible to make sure that the translation was appropriated. After the translation process, the FMA was evaluated by a scientific committee from the LITA / UFTM for final approval, where they verified the semantics, concept and quality of translation. The unique version of the translated questionnaire was proposed to adult subjects who were wheelchair users for displacement, associated to a non-governmental organization of town in Brazil designed to people with physical disabilities. Future steps are: use of the FMA with people, who use wheelchair as their primary means of mobility to check for culture appropriateness, validation and standardization of the FMA in Brazil. The contribution in the area of assistive technology and occupational therapy training to work with people with physical disabilities that use wheelchairs (or other mobility devices) to independently move, suggests the importance to continue the process of translation and validation of the questionnaire into Portuguese. Thus, this research will continue with the validation of the instrument FMA by the authors of this research and the original authors of the instrument. Objectives: translate the FMA into Portuguese; Validade the FMA with wheelchair users from Brazil and standardize the FMA in Brazil.

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SS2: ISS Town Hall Forum:

Standardizing to a Higher Standard: Addressing QUALITY as a Known Challenge with Wheeled Mobility Products

Moderator:
Kendra Betz, MSPT, ATP

Panelists:
Jim Black
Rory Cooper, PhD
Doug Gayton, ATP
Simon Hall
Leslie Samuelson, OTR/L, ATP
Dan Wyles,ATP

Abstract

Compromised quality of wheeled mobility products is a concerning problem particularly for consumers but also for all professionals involved in the wheelchair service delivery process. Despite the efforts of the International Standards Organization (ISO), the American National Standards Institute (ANSI) and the Rehabilitation Engineering and Assistive Technology Association of North America (RESNA), published research indicates an on-going trend of less-than-optimal product quality that ultimately carries a negative impact to the wheelchair user and impairs our ability to provide appropriate professional services.

This lively audience-interactive session will provide a town hall type forum for discussing this controversial topic with representation of the many aspects of the quality dilemma. The session will begin with an overview of an important study published in 2012 regarding increases in wheelchair breakdown, repairs and adverse consequences. The lead author will share the research findings which indicate a concerning trend of compromised wheelchair quality with greater implications for certain populations and wheeled mobility technologies utilized, as well as variability amongst funding sources. Following overview of the study, response and commentary will be presented by a diverse panel of international stakeholders to include representation from all aspects of the industry including a consumer, manufacture representative, supplier, clinician, rehabilitation engineer and funding source representative. The audience will then be encouraged to participate in the interactive discussion by proposing questions to the panel, adding key points of clarification or additional information, and contributing to the identification of potential solutions and necessary actions to address the identified challenges with quality of wheeled mobility products.

Objectives

1. Identify 3 trends in wheelchair repairs and consequences compared to historical data
2. Relate repairs and consequence to wheelchair type, seating functions, and funding sources
3. Discuss three different potential options for increasing wheelchair quality

Published full-text article with references is available on-line at: http://www.sns-magazine.com/pn/images/article/201208/Increases_in_Wheelchair_Breakdowns_Repairs.pdf

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Saturday

March 9, 2013

IC63: Foamology 101

Sharon L. Pratt, PT
Evan Call, MS, NRCM

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. List three expectations of foam.
2. Define two methods used to measure the performance of foam.
3. Identify two design features that are measurable when looking at any foam cushion.

All foams are not created equal, so how confident do we feel with regard to the distinguishing features between different types of foam?

This presentation will discuss the different types of foam used in the seating and positioning world. Topics that will be discussed include: what is foam, expectations of foam, how we measure foam and foam cushion design criteria. We believe that at the end of the presentation, the audience will have a firm grasp on the characteristics that make each foam unique, as well as a better understanding of how to include foam properties into their everyday decision making.

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IC64: Man vs. Chair! Who Wins in the Challenge of Mobility?

Sheila Buck B.Sc.(OT), Reg.(Ont.), ATP

A person in a seated position must be stable and secure in order to maximize functional potential. The use of physical restraints is in direct opposition to the principle of autonomy. When prescribing mobility devices, the chair design must address physical, perceptual, cognitive and social needs. A secure and comfortable seated position must be created in order for a functional movement to begin. Once movement begins, it must be stress free and "do no harm" to the client's physical and emotional sense of well being. If this does not occur, a client will tend to slide out of position during mobility. As a result, the client no longer attempts activity and often restraints are applied to "hold" them in the chair. Manual, wheeled mobility needs to be provided in a manner that will not only address the physics of movement, but also maximize positioning and postural control with gravity assistance. Improperly prescribed mobility devices can result in clients not realizing their potential, because they have not been provided with the opportunity to prove a difference in functioning.

Have you ever asked yourself, "should I use a regular wheelchair or dynamic tilt in space", when working with a client who requires increased positional support. What is the impact that each modality has on functionality and can it alter how your client functions overall in the end? Too often tilt in space may be ordered as an easy way to "keep a client in their chair" and as a result, many long term care facilities have considered tilt in space to be a form of restraint. Is it a restraint or a method of positioning? In order to answer these questions it is important to have a "skill bag" ready to help you in your decision making process.

Learning Objectives

1. To review the assessment data required to ensure correct sizing for wheelchair prescriptions and reduce the need for restraint use
2. To review set up particulars related to optimal functioning of lightweight adjustable axle wheelchairs
3. To review the dynamics of tilt in space and how this will increase or limit function of the client with respect to posture and mobility

Information You Need to Know:

- posture and seating principles
- ergonomic and biomechanical principles for mobility
- how to complete a mat assessment
- how to measure a client for a wheelchair
- wheelchair and seating measurements and parameters
- advantages and disadvantages of wheelchair and seating features, benefits and options

A good mobility evaluation involves assessment and consideration of many client factors including physical, functional and lifestyle. These and many other factors play a role in determining the prescription of seating components and wheelchair frames/design. How do product design features meet specific client needs? How do you know what cushion or back will work the best and once installed, does the chair design and set up really make a difference? How do you balance the client's needs and wants for function with theoretical concerns for pressure management and postural support? Establishing a list of priorities and goals is essential in developing a mobility system that will not only meet the client's physical needs, but also address functional and lifestyle concerns. Just as important is the need to ensure that the prescribed wheelchair and seating system is set up appropriately on delivery. As well, it is important that care givers are trained on the set up of the chair, functioning of the client in the chair, and transfers into the wheelchair in order to maximize positioning and function. With respect to education, can we learn from what we do on a daily basis? Do our past mistakes help us to learn more about how positioning affects mobility, and how that combination affects functionality?

The wheelchair should be considered for adjustability in centre of gravity, wheel access, as well as floor access for foot propulsion which can be altered by changing the anterior/posterior tilt of the chair or seating. Seat depth and width will affect positioning as well as seat to back angles and overall chair orientation in space. Armrest height is important for trunk control and may need to be adapted higher or lower than "standard" armrest heights. Footrest positioning is very critical. Too often this is the last "set up" of the chair when indeed it may fully change the whole seated position. Consider under cuts on the seating with a shorter wheelchair seat/frame depth to allow for foot loading on 90 degree footrests while a lightly longer upper cushion length will still support the thigh. Custom hangar attachments may be considered to allow for the footrests to be angled to accommodate a windswept position.

When considering manual wheelchair mobility one must investigate varying methods of propulsion and the benefits of each and the requirement to maximize set up for performance. Ensuring the appropriate prescription and set up of a manual wheelchair will ultimately preserve function and posture, reduce the use of restraints and promote a sense of well being and quality of life for our clients. The prescription and functionality of lightweight adjustable axle wheelchairs, as well as manual dynamic tilt wheelchairs must be reviewed for safety, agitation reduction and self prolusion. When looking at chair frame design and weight it is important to remember the client's balance point within the chair as well as safety with propulsion. Remember that centre of gravity is affected by axle position, caster placement, and caster orientation and is with respect to the client's centre of gravity when they are sitting in their final seated orientation and seating system. Centre of Gravity refers to the "Balance Point" of an individual in relation to the wheelchair. C.O.G. is affected by axle position, caster placement, and caster orientation as well as the placement of the seating system in the wheelchair. Changing the axle position forward or back, will affect rolling resistance and change propulsion efficiency. IT can also change turning radius, downhill turning tendencies and caster flutter. The axle position also changes the hand contact angle or the availability of handrim surface area used by the client in propulsion. This can alter the amount of muscle effort used by the client, joint excursion, and stroke frequency. Seat to floor heights as altered by the rear axle and caster placement will also change the biomechanics of propulsion. A lower seat position can improve push biomechanics by greater hand contact with the handrim changing the upper extremity range of motion requirements. Adjusting the wheelchair configuration to each individual client allows the wheelchair to enhance postural support which is critical for optimal functioning of the client.

Propulsion technique is often determined by amount of supported sitting or stability provided once seated support is determined. It is critical to observe if mobility is maintained or changed. Manual propulsion can occur in a variety of manners. Environment, speed, distance and time are critical factors in determining if a client is to use manual propulsion or power.

Two hand: full arm function

- position client with arms fully extended down mid finger tip to axle of chair
- hand grasp mid rear of wheel, follow rotation through to mid forward position of wheel.
- maximize freedom for scapular mobility, clearance at brake level for thumb mobility

Two hand: arm extension minimized by kyphosis/ strength

- position client with elbows flexed to 90 degrees on hand rim, maximize shoulder excursion as able without elevation

One hand/ One foot

- non-functional leg with full thigh support
- determine seat to floor height based on heel measurement and movement of foot:
- Toe/ Toe – seat height will be higher
- Heel/ Toe – seat height at K/H height
- Shuffle – seat height slightly higher than K/H
- Hand position on wheel based on trunk position/ arm strength often smaller wheel to accommodate low seat to floor height

Two foot propulsion

- base seat to floor height as noted above
- do not angle seat posteriorly – creates increased posterior pelvic tilt, tendency to slide forward to reach floor – often more efficient to angle seat anteriorly
- support sacral area forward to maximize hamstring movement and hip mobility
- requires thigh support through positioning belt to maintain position on cushion

Sheila is an Occupational Therapist from Ontario, Canada and has been actively working in the field of seating and mobility for over 20 years. She provides consultation, assessment and treatment in the area of seating & mobility, accessibility, and ergonomics, through her company Therapy NOW!. Sheila has spoken extensively across Canada, the US and Ireland on seating and mobility issues. She has also authored, “More Than 4 Wheels: Applying Clinical Practice to Seating, Mobility and Assistive technology”, a practical guide to seating and mobility for dealers, manufacturers and therapists interested in the field of assistive technology.

Buck, Sheila. More Than 4 Wheels: Applying clinical practice to seating, mobility and assistive technology. 2009

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IC65: Focus Group on Developing a New Power Wheelchair Driving Skills Assessment

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Brad E Dicianno, MD

Learning Objectives

1. List five tasks that need to be tested for driving performance assessment, in an indoor and outdoor setting.
2. List three tools that could be used to screen individuals prior to evaluating their driving performance.
3. Discuss the pros and cons of each of the three assessment tools

Abstract

Training clients in the use of power mobility devices is important, not only to enhance safety and driving performance, but also to increase satisfaction with the devices and conversely decrease abandonment. However, the multitude of factors involved with power wheelchair driving has made it difficult to develop standardized protocols that could be applied universally. This has warranted more research about the cognitive, sensory and motor capabilities essential for power mobility driving. This session will be a focus group designed to collect information from suppliers and physical and occupational therapists, which will be used to develop a robust power wheelchair driving assessment and training protocol.

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IC66: Biomechanics and Its Application to Seating

Joel M. Bach, PhD
Kelly G. Waugh, PT, MAPT, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Understand three basic biomechanical principles and their general application in seating.
2. Explain, using biomechanical concepts, why a forward head posture is so difficult to control in seating.
3. Describe the use of three-point control in the management of a scoliotic sitting posture.

In this course, we will review basic biomechanical, physics and engineering principles (forces, pressure, moment arms, rotational movement, etc.) and show how these principles are applied in wheelchair seating. We will then take a biomechanical approach to the analysis of some common postural deviations such as posterior pelvic tilt, kyphosis, pelvic obliquity, scoliosis, and abnormal postures of the head and neck. Analyzing abnormal sitting postures and movements from a biomechanical perspective can help guide your problem solving and result in more strategic and efficient seating interventions with less trial and error and improved outcomes for the consumer.

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IC67: The Benefits of Gait Training

Melissa Fansler, ATP

Gait training is a widely used therapeutic practice in many different settings and can benefit patients with many different diagnoses. The ideal end result is a patient becoming ambulatory when they were not so before. Even though this is not always a realistic goal, there are other benefits to gait training that are equally important. These benefits are physical, social, and psychological. Each category has measurable outcomes to show these benefits.

The first category of benefits are physical in nature. Physical benefits include a decrease in the likeliness of developing Osteoporosis. As treatment continues, this benefit can be measured by bone density scans as well as a decrease in bone injuries. Additionally, Gait Training improves overall trunk alignment, prevents contractures, decreases spasticity, and improves range of motion. Spasticity and Tone can be measured by the Ashworth Scale. pain levels can be measured via a pain chart and patient reporting. Patients also will be able to complete more tasks because of an increase in trunk, head, and neck control. This can also be measured by caregiver, patient, or therapist observation. Gait Training can also help internal organ function improve which can be measured by the number of UTI's experienced, oxygen concentration in the blood, regular bowel function, and increased circulation. Increased brain function may also be apparent and patients may be more alert to their surroundings and their environment.

Social benefits can also occur from a Gait Training routine. This begins with the ability for patients to stand eye to eye with their peers, and engage in social or sports activities they were unable to before. Patients are also able to tactilely experience their environment. A video shows the increased social interaction they would not be able to have without assistive technology.

Patients can also experience psychological benefits from Gait Training. This includes the ability to be more independent as well as increased confidence. Increased awareness of their surroundings and their environments, increased curiosity, and taking more initiative can also be added benefits to gait training.

Outcome measurability is crucial in evaluating a patient for Gait Training and determining the effectiveness of it. There are many types of evaluating tools to use. Also, when considering if Gait Training is an appropriate treatment option, it must be taken into consideration how the equipment will be funded, if additional assistive technology is needed, and in what capacity the equipment will be used. The type of gait trainer is crucial as well

Different variations of assistive technology can be used to teach and assist a person to walk. Many times, a combination of devices is most effective. When it comes to actual gait trainers, there are two kinds; anterior and posterior. Anterior is a forward facing gait trainer with more components that can include a chest support, pelvic support, leg straps/saddle, and frame. Other accessories can include arm supports, leg abductors, headrests, ankle straps, lateral supports, directional locks, tray, scissor board, drag brakes, back pad, and anti-reverse wheels. Posterior gait trainers usually have less supports and are rear facing. This allows the user to get closer to items and interact with their environment more. Many patients can progress from an anterior to a posterior model. There are many different models of Gait Trainers on the market today, each of which has its own benefits over the others.

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IC68: An Activity-Based Restorative Therapy Approach to Wheelchair Prescription

Erin Michael, PT, DPT, ATP
Meredith Bourque, DPT
Beth Farrell, PT,DPT,ATP

Learning Objectives:

1. Define ABRT and differentiate ABRT principles from the traditional SCI therapy model.
2. Identify three ABRT principles used in wheelchair prescription and apply them to the SCI population.
3. List five ways in which wheelchair prescription can be utilized to promote ongoing recovery of function following SCI.

Introduction

The traditional spinal cord injury (SCI) rehabilitation model provides treatment interventions above the level of neurological lesion with the goal of compensation for loss of function. Within the traditional framework of SCI rehabilitation, wheelchair prescription is focused on compensation for lost function rather than promoting activity. However, mounting evidence shows that neuroplasticity and regeneration of the spinal cord increases with activity.

Activity based restorative therapy (ABRT) provides activity both above and below the level of the lesion in order to optimize the neurological system. Within this ABRT framework, the goal of wheelchair prescription is to provide the necessary support for independent functional mobility in addition to promoting activity.

Following this course, participants will be able to incorporate the principles of activity based restorative therapy (ABRT) into wheelchair prescription in patients with spinal cord injury to facilitate ongoing recovery and strengthening post injury.

Defining ABRT

ABRT is characterized by providing intensive, task specific patterned activity both above and below the level of the spinal cord injury. The goal of ABRT is to restore central nervous system function and promote neural recovery and regeneration. Key therapeutic interventions include FES ergometry, locomotor training, load bearing, patterned activity, task specific practice, aquatic therapy, and an individualized home rehabilitation program along with community reintegration.

Applying ABRT Principles to Wheelchair Prescription

The following principles are incorporated into wheelchair prescription within an ABRT framework:

1. Adjustability. This allows for adaptations to the seating system following neurological or functional recovery. Incorporating adjustability into the patient's wheelchair prescription ensures that the seating system can be reconfigured to meet the patient's ever changing positioning and mobility needs.

2. Activity. This promotes neural recovery and regeneration by providing opportunities for the patient to activate trunk and upper extremity musculature.

3. Accountability. This empowers the patient to take responsibility for repairs and modifications to the seating system and ultimately, the patient's independence with mobility.

Promoting Neurological Recovery through Wheelchair Prescription

Applying the core principles of ABRT to seating and positioning allows the user to be more active in his or her wheelchair without compromising the patient's safety or independence. Prescription of an adjustable seating system allows the patient to become an active user instead of a passive sitter. Additional methods to increase patient activity and participation include the consideration of manual propulsion or power assist systems when UE strength, ROM, pain and shoulder integrity allow.

Conclusion

Wheelchair prescription following SCI can be used as a tool to further promote activity and neurological recovery. When prescribing a seating system for a patient with SCI, one must consider the adjustability of the seating system, activity level of the patient, and accountability of the patient for the seating system. Applying an activity based restorative therapy approach to wheelchair prescription not only allows for maximal independence at the time of evaluation, but also increased adaptability to meet the patient's future needs.

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IC69: ALS and Therapy Interventions: A Focused Approach

Susie Calyer, OTR/L, ATP, CAPS

ALS, or Lou Gehrig's disease, is a fatal degenerative neurological disease that has little viable treatment and no cure. It is manifested by progressive weakness and wasting of muscles innervated by the affected neurons; fasciculations and cramping commonly occur. It affects adults (typically, older adults), and usually is fatal within 2–5 years of onset. It is in the most common subgroup of motor neuron diseases, and the only one manifested by a combination of upper and lower abnormalities. At any given time over 7000 people in the United States are living with ALS, and each day, every 30 seconds, someone is diagnosed with the disease. Despite the significant numbers, I find that confusion regarding therapy treatments and interventions abounds in all areas including Respiratory, Speech and Language, and Occupational and Physical Therapy.

The goals of this presentation are to educate and raise awareness with a focus on therapeutic interventions for coping and managing symptoms. Compensatory techniques are paramount and many different approaches are discussed. The target audience includes Occupational and Physical Therapists, Skilled Nursing Professionals, Rehabilitation Directors, Physicians (notably Neurologists and Physical Medicine and Rehabilitation), Social Workers, and Rehab Managers.

Many Therapists do not see enough ALS to understand the nuances of each person's progression and can fall back on a "cookie cutter" approach such as used with traditional Orthopedic diagnoses. Other therapists may have a strong background in Neurological Disorders, and may try to utilize traditional Neurological approaches, attempting to treat the patient similarly to a person with a CVA or MS. Neither of these approaches tends to work well, and many people with ALS (PALS) are discharged from therapy without receiving the type of therapeutic intervention that they really need. I draw on my experience of appreciating the progression from diagnosis to passing of over several hundred patients and share my experiences on beneficial, appropriate interventions that really make a difference, most importantly in utilizing a compensatory approach to manage symptoms and assist with quality of life interventions.

Each PALS has a different advancement of his disease course and thus the treating therapist must take this into account. Gross generalities for all patients, such as always immediately ordering a PMD for a newly diagnosed person (such as happens in our area sometimes with Veterans), does not work well. Not every PALS is going to have lower extremity involvement, and I find that frequently by the time the person is ready emotionally and physically to utilize wheeled mobility, many times the chair procured in the beginning stages of the disease is no longer appropriate—it no longer fits their needs, does not fit them physically, or has been ignored for so long (think "garage storage"...) that the batteries are dead and it needs good maintenance attention. To think that each PALS will complete the course of the disease with complete paralysis of all voluntary muscles except their extra orbital mobility is erroneous (a common misconception I run across by patients and therapists alike); many may actually pass while continuing to be safe ambulators due to total respiratory involvement. Thus the course of each person's disease must be viewed as an individual process and treated accordingly. This will be discussed in greater detail. A Therapy Interventions Handout developed by myself is used at all new patient visits; this will be distributed for your personal use prn. There are, however, certain significant predicting factors that I have found to impact a PALS progressive course, including: recent or current smoking, family history of ALS (hereditary ALS affects ~ten per cent of all those diagnosed), current overall cardiac health, BMI, and presence of Frontal Temporal Lobe Dementia (it is estimated that ~twenty five to thirty per cent of those diagnosed with at some point present with FTLD). FTLD will be discussed in more detail as it absolutely affects each person's ability to comprehend the treatments offered, the disease course, the equipment procured, and end of life choices.

The evolution of ALS is such that I have heard it called "a very expensive disease" to experience as a family. Equipment needs are progressive and insurance frequently only reimburses for a finite number of needs, for example only covering one wheelchair, forcing a choice for all chairs and not allowing for multiple chairs nor a progression of chairs… it often comes down to "custom manual vs. custom power??" This can create a significant financial burden on the family for other equipment needed such as lifting devices, ambulatory aids, ADL devices, augmentative communication devices, computer modifications, and work related equipment. Many may also need to consider home modifications to enable continued residence in their home. St. Peter's Regional ALS center in Albany NY has a ~2500+ piece equipment loan closet, which is available to our patients free of charge for the length of the need. We have small adaptive equipment for self care ADL's, patient lifts, stair glides, ceiling lifts, EZ Lift chairs, walkers/Rollators, manual and power wheelchairs. Additionally, most regional MDA offices have an equipment loan closet, offering this as a benefit to their patients, if they register with their local office. ALS is a disease that the MDA covers and they offer other benefits as well, which will be discussed.

Wheeled mobility is a significant concern as a great proportion of PALS do eventually need ambulation assistance whether it is due to Lower Limb spasticity, Lower extremity weakness, or respiratory involvement negatively affecting overall breathing/oxygen availability to each muscle group. The Mobility Algorhythm developed and used at our clinic has us initially recommending simple balance aids, progressing all the way to power mobility if appropriate. Significant time is spent educating with most PALS regarding processes, choices, options, and that person's needs as I understand them on an individual basis. Many mobility choices are dictated by individual insurance coverage, however my rule of thumb is to get the most seat functions as possibly able depending on coverage, and recommend private payment of anything not able to be paid for by insurance prn. My experience is that if a PALS becomes significantly physically disabled in terms of voluntary muscle movements, which many do but it is quite difficult to predict this in the early stages, having a loaded wheelchair is paramount for comfort in the later stages of the disease.

Many times I find that I need to make modifications to a power chair if a person lives long enough with the disease, simply due to the effects of gravity on a person's increasingly weakened physical stature. I try to order a chair with the ability to increase seat depth, first and foremost, but width modifications can be an issue as well. Many of my patients will find themselves losing a fight with gravity, not in the traditional sense but as I see it, becoming much more pear shaped and sitting with a significant pelvic tilt that is due to trunk weakness. This necessitates a change in depth to continue appropriate weigh bearing area in the lower extremities. This is also important to note if a person qualifies for a new chair, which may happen if insurance changes or they live for an extended period of time with significant disability. Overall lower extremity weakness can indicate necessary hip guides due to excessive "frog legging" which is uncomfortable for most especially if due to weakness. Spasticity can affect comfort in a chair, requiring mods for positioning. And of course, alternative drives are explored at length, on an individual basis, but unfortunately I find that there are not a lot of reasonably appropriate, affordable options due to the nature of the disease progression. For example, head arrays tend to be somewhat ineffective in general, as they typically can also fatigue the muscles that assist with respiration, and if the arms are affected (necessitating an alternative drive) than the neck is typically weakened as well. Or, if a PALS has such limited movement that he needs for example an infrared switch, the progression of moving between drives/positioning functions etc. is quite fatiguing for the individual and becomes unreliable. I am typically amazed at how long a person is able to mobilize themselves with a joystick, but unfortunately, typically for what I see, if a person is moving beyond a joystick, then he many times also chooses an attendant control along with an alternative drive, and the caregiver typically ends up with most of the mobility responsibly. Overall fatigue level is a major factor, and sometimes more important than driving is the ability to self-regulate for comfortable positioning. I find that providing alternative access for seating and positioning comfort typically ends up being much more important than the ability to drive the chair. This will be discussed at length. (Disclaimer: I tend to leave the working out of alt. drives to the vendors as I unfortunately have very little time to explore this in our working treatment model. I do, however, provide significant input as to suggestions and empirical data for evaluating appropriate strength areas in a body area for alt. drives.)

Education is a major part of any therapist's intervention with ALS including pressure relieving with mobility devices, etc. Surprisingly few of my patients end up with any kind of pressure wounds, despite PALS' admitted poor follow through of education/recommendations. Spasticity and Pain are major concerns when choosing seating systems, as these major symptoms that are typically missed or discounted by other therapists as natural sequelae of ALS.

Much of the information in this presentation is anecdotal, gleaned from twenty years of treating ALS, with the past six years ALS being the sole diagnosis I treat in my clinic. I will present many pictures of those whom I have treated, and show through these pictorials and candid, informal discussion, the progression of the physical nature of some of my patients.

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PS9.1: The Use of Tilt-in-Space in Seating Systems

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Introduction

Tilt-in-space (TIS) and back recline wheelchair functions are increasingly used for adults with physical disabilities. Tilt-in-space systems may be considered for various reasons, some of which include increasing comfort and rest (Lacoste et al 2003). Disadvantages of tilt-in-space wheelchairs compared to conventional wheelchairs include initial and subsequent costs, their larger size and complexity. Tilt-in-space wheelchairs are also heavier and have been found to be less manoeuvrable than conventional wheelchairs, restricting access to transport (Dewey et al 2004).
Tilt-in-space (TIS) is a design feature that can be found in both static and dynamic (wheeled) seating systems; and offers different functionality for individuals who require it. Some occupants will benefit from the use of TIS for example, to provide comfort, redistribute pressure over the bony prominences of the buttocks, for rest periods, or to encourage an upright head position (Lacoste et al, 2003). However, it is unclear what the optimum tilt angle should be. This systematic review aims to determine the use and effectiveness of TIS in seating systems.
With no evidence based criteria or guidelines for prescription of tilt-in-space or back recline, practices around the provision of these systems varies widely. It is essential that health professionals prescribing and engineers designing seating equipment are well informed regarding the impact they have on a person's long term health, wellbeing, quality of life and function. The focus of this evidence-based report was to review and critically appraise the published literature regarding the effects of using tilt-in-space and back recline on adults with physical disabilities. This report highlights the stated uses of tilt-in-space and recline, in addition to detailing the specific angles of tilt-in-space and recline used, with a view to ascertaining clinical and design implications

Methods

Eight electronic databases were searched comprehensively: ASSIA, BNI, CINAHL, EMBASE, ISI Wed of Science Conference Proceedings, Medline, OTDBase and PubMed; using the keywords tilt-in-space, back recline, seating, pressure ulcer, and pressure sores. Studies only qualified if tilt-in-space or back recline were used as the intervention. These databases were searched for relevant articles written in English between 2000 and end of June 2011.

Inclusion criteria

Primary research studies published between the years 2000-2011, written in the English language were considered. Studies only qualified if tilt-in-space or back recline were used as the intervention. Additionally all studies had to have adult participants.

Exclusion criteria

Articles published before 2000 and not written in the English language were excluded. Primary research studies which did not address the literature review question were not included.

Results

After removal of duplicates and application of inclusion criteria, sixteen studies were eligible for this review. Results suggest TIS for pressure management should have a tilt of at least 30 degrees to be effective, although it is difficult to specify the optimum degree of tilt or duration of use. Also, authors suggest that given the limited pressure relief compliance, other approaches and improved training may be required for some clients. Further research is required, along with the need for clinicians to be very explicit on the reasons for prescribing TIS as this influences the degree of tilt required for the chair occupant.
Below you can see the different angles of TIS used, the purpose for using it and the references.

Degree of TIS	Purpose for using TIS	Authors
Backward tilt between 20 and 45 degrees	Decrease pressure under ischial tuberosities by approx 24mmHg	Michael SM, Porter D and Pountney TE (2007)
Backward tilt of 65 degrees	Decrease pressure under the ischial tuberosities by average of 47% in 10 persons with SCI	Henderson JL, Price SH, Brandstater ME and Mandac BR (1994)
Backward tilt of 35 degrees	Failed to achieve statistical reduction in sitting pressures	Henderson JL, Price SH, Brandstater ME and Mandac (1994)
Backward tilt of 20 degrees compared with a neutral upright position (with back slightly opened to a 100-degree recline	Reduction in maximal seating pressures by 11% in active SCI wheelchair users	Hobson DA (1992)
Backward tilt of (a) 15 degrees, and backward tilt of (b) 30 degrees	Child demonstrated more consistent in: (a) head positioning, and in: (b) trunk and head control as child tired	Angelo J (1993)

In the table below you can see the use of tilt in space and the different references used.

Use of TIS	*Authors*
To decrease *fatigue* and *energy conservation* for those with muscular weakness or limited upright endurance	Nitz JC. 2000. Zollars JA. 2010
To decrease *pressure* under bony prominences of buttocks	Batavia M. 2010; Burns SP & Betz KL. 1999; Henderson JL, Price SH, Brandstater ME & Mandac BR. 1994; Hobson D. 1992; Michael SM, Porter D & Pountney TE. 2007; Nitz JC. 2000; Pelllow TR. 1999; Vaisbuch N, Meyer S, Weiss PL. 2000.
To enhance *comfort* (especially for those unable to weight shift)	Shaw G & Taylor S. 1991; Zollars JA. 2010.
To improve *posture*, including head control and trunk control; and to prevent sliding out of chair.	Angelo J. 1993; Batavia M. 2010; Bendix T& Biering-Sorensen F. 1983; Chan A & Heck CS. 1999; McClenaghan BA, Thombs L & Milner M. 1992; Shaw G & Taylor S.1991
To attempt to slow the progression of *spinal deformities*	Nitz JC. 2000; Zollars JA. 2010.
To reduce *oedema* of lower limbs	Zollars JA. 2010.
To improve *breathing, circulation* and *digestion*	Chan A & Heck CS. 1999.
To enhance *function of upper limbs*	McClenaghan BA, Thombs L & Milner M. 1992; Nwaobi OM. 1987.

Impact on service users:

Tilt-in-space systems may be considered for various reasons, some of which include increasing comfort and rest (Lacoste et al, 2003). Users report compromising between using TIS for comfort and the reduced manoeuvrability and increased size of the seating system.

Implications for occupational therapy:
Clinicians need to include education in the use of TIS for users; serving to increase compliance on usage of TIS for the promotion of good postural alignment and redistribution of pressure to prevent pressure ulcers. Additionally, the clinician should advise on the degree of tilt and or recline to be used; how often, how long, and for what purpose. Clinicians also must consider the impact of TIS on ease of use, transportation and manoeuvrability of the chair (Dewey et al, 2004).

In prescribing tilt-in-space clinicians must be aware of the physical environment and whether it can support its use and size. They should also consider the demands upon the caregivers where the use of TIS can be used to reduce the number of daily transfers and physical handling of the chair occupant. They should establish if the client and caregiver wish to pursue TIS after considering the manoeuvrability and transport issues.

When using TIS, back recline, and or seat incline the clinician should be appraised of the evidence not only to which angle is optimum for what purpose; but additionally how different degrees of tilt impact on the function and stability of the chair occupant depending upon their clinical condition.

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PS9.2: The Effectiveness of Specialist Seating Provision for Nursing Home Residents

Orlagh Daly
Jackie Casey
Martina Tierney
Dr Suzanne Martin

Learing Objectives

This study aims to:

1. Identify the postural issues within seating evident in nursing homes.
2. Understand the impact of a poor sitting posture for residents in nursing homes.
3. Highlight the effect that sitting postures can have on the residents' care giver.
4. Identify the contribution of a seating assessment and provision of the prescribed seating equipment in reducing pressure ulcers.

Introduction

Few studies have reported the use of postural management programmes and the research based evidence supporting this practice has been limited. Clinical practice and decision making have generally depended on expert opinion combined with individual practitioner experience and preferences.

The literature describes the use of seating systems to increase comfort and quality of life (Telfer, 2010), improve upper extremity function (Stavness, 2006), and improve respiratory function and/or prevent or delay deformities (Holmes, 2003). Littleton (2011) demonstrated the positive effect of sitting and side lying on respiratory measurements (oxygen saturation, heart rate, respiratory rate and chest wall excursion).

This research explores the effectiveness of specialist seating provision within a nursing home environment and how it has the potential to impact positively on the health and wellbeing of residents and their caregivers. It will identify the key principles of correct positioning, seating and mobility and the influence this can have on health of older people.

Guidance is available on most aspects of pressure ulcer prevention and management however few research papers specifically address the particular issues for patients who are seated for long periods. When pressure ulcer prevention and management are discussed, the specific issues most often addressed are the use of pressure-redistributing beds and mattresses, risk assessment, patient repositioning and local management of established pressure ulcers (EPUAP, 2009).

Methods

A mixed methods design, utilising both standardised tools and those designed by the research team, based on issues identified in the literature has been developed and received ethical approval.

The caregiver and the resident will both complete a questionnaire before and after the 12 week trial period. A seating assessment will be completed on each participant before and after the 12 week period to monitor and record any changes in posture, skin breakdown or any changes in medical presentation.

Two nursing homes will be identified and consent will be gained from the nursing home manager to complete the studies in each nursing home. This study will highlight the need for improved seating systems in nursing homes and they will benefit the caregiver and the resident.

Consent must be gained before participating in the study. A purposive sample of two local nursing homes will be used. Residents from these nursing homes will be invited to participate in the study. They will be over aged 65 and will be identified by the care home manager as needing a seating intervention due to postural difficulties.
Information letters will be sent out beforehand to all participants and families involved. For those clients who do not have the capacity to consent, the information letter will be given to residents' next of kin.

The two nursing homes will be selected from a similar geographical area. They will be matched according to size and similar nursing needs. Twenty eligible participants will be randomly selected from each nursing home, using computer generated random numbers once the inclusion criteria has been applied.

Interventions

There will be two intervention arms used within this study.

Intervention A will include 20 participants and will involve completion of a seating assessment before and after the twelve week trial period and the provision of a suitable seating system. The chair selected will be determined on postural ability and limitations of each participant. The range of chairs available offers the ability to cater for a vast range of client needs; from pelvic rotation and obliquity, limited hip flexion, tight hamstrings, scoliosis, and the opportunity to tilt to redistribute pressure over the 'at-risk' areas of pressure sores therefore meeting required postural needs over a 12 week period.

Intervention B will be the control group of the study and will be carried out in both nursing homes at the same time. Ten residents will be recruited in each nursing home therefore a total of twenty participants will take part in Intervention B and will receive a seating assessment before and after the 12week trial period to record any changes if any, with regards posture, medical presentation and medication received. They will be assessed over the twelve week period in their existing chair.

At baseline the following assessment tools will be administered for participants in both the intervention groups.

Clinical factors:

- Demographics (such as age of client, medical history etc)
- Seating assessment (of resident's sitting balance and postural needs, sitting skills, range of movement for sitting and transferring in/out of the chair)
- Digital Photographs (to be taken before and after initial assessment with residents sitting in their original chair and in the chair provided following seating assessment)

Physiological factors:

- Force Sensing Array (Pressure Mapping)
- Braden Scale to measure risk of developing pressure ulcers
- Pulse Oximeter to measure saturated oxygen levels
- Quality of life factors:
- Caregiver questionnaire to gather any changes, if any before and after trial period
- Resident questionnaire to gather changes, if any, before and after the trial period
- Visual analogue scale (client comfort scale)

The chief investigator will administer these outcome measures with the nursing home resident, the caregiver and/or next of kin. Following the intervention period of 12 weeks the same outcome measures will be re-administered.

Results

This presentation will report on the development of this project and the outcome measures to be used to identify the effectiveness of individualised seating prescriptions for nursing home residents. There will be two groups with the same baseline assessments being completed with all participants in each group.
We will explore results for each individual, and between groups of participants.
There should be increased awareness of need to provide individual seating assessments and seating, and also the significance of postural management to client function, quality of life and prevention of secondary ill health.

Conclusions

This relevant and current piece of research will give attendees up to date information on postural evaluation, risk analysis, strategies for identifying static chair accessories and protocols needed for appropriate seating and positioning recommendation. The needs of each patient are different and require individualised evaluation to provide appropriate clinical guidance for the ordering recommendations of an appropriate static chair (Engstrom, 2002).

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PS9.3: Where's My Wheelchair?

Joan E. Padgitt, PT, ATP
Randy Potter, ATP, SMS
Jacqueline Black, MSPT
Patrice Kennedy, MPT, ATP
Ryan Crosby, ATP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. List five key data needed to track their wheelchair clinic operations.
2. dentify three benefits to use a database in conjunction with patient care
3. List two existing software programs to set-up a simple database for their clinic.

Data base is defined as "a comprehensive collection of related data organized for convenient access, generally in a computer" (dictionary.com). The use of data bases are widely used in the medical field to collect data as far reaching as the availability of a hospital bed to the management of pressure ulcer risk. This presentation will detail how the Denver VA Wheelchair Clinic has implemented a Microsoft Access database to track the timelines of our delivery service process from the time we receive a WC Clinic consult/referral, schedule initial evaluation, and the actual evaluation date. We then track the dates the equipment is requested, received, assembled, and culminate in tracking the final issue/fitting/training and recheck appointments. We will discuss how reports are generated on a weekly basis to track veteran's wheelchairs to insure that each step is performed in an acceptable time frame and that no step will slip through the cracks.

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PS9.4: Development of a Wheelchair Mounted Robotic Device for Assisting with Transfers

Garrett G. Grindle, MS

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Define the incidence and cost of transfer-related injuries.
2. List three types of devices currently available for transfer assist.
3. Describe a new robotic technology aimed at making transfers easier and safer.

The ability of people with mobility impairments to live in their homes and communities with maximal independence often hinges, at least in part, on their ability to transfer or be transferred by an assistant. Transfers pose the risk of serious injury to both the person being transferred and to caregivers assisting with transfers. While many devices exist for aiding transfers and numerous research studies have explored methods to reduce injuries, injuries are still prevalent in home and healthcare settings. This work provides a brief overview of commonly used technology for transfers and introduces a novel Robotic Transfer Device (RDT) that aims to address some of the shortcoming of current technology. The RTD is a fully powered robotic arm that is attached to a power wheelchair that is capable of lifting a person. Given its portable nature, it can be used in the community where it is difficult to use floor or ceiling lifts. It utilizes force, angle and displacement sensors, along with an onboard computer, to prevent the device from entering some unsafe situations. The RTD also has a unique direct interaction human-computer interface, which allows the system to be controlled in an intuitive manner.

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IC70: Ethics and Certification: An Update on Raising the Bar of Professionalism

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Mike Seidel, ATP, CRTS,
Stefanie Laurence, B.Sc. OT, OT Reg. (Ont.)

The RESNA credentialing process began in 1992. On October 23, 1996, when the first test was administered with 64 candidates, it was unclear where the Assistive Technology Professional (ATP) credential would lead the Assistive Technology (AT) industry. Since then the Professional Standards Board (PSB) has established a complaints review process, consolidated the Assistive Technology Provider and Assistive Technology Supplier into a single unified ATP certification, rewritten the exam, moved to computer based testing and launched advanced certification exams, including the Seating and Mobility Specialist (SMS) exam. With more than 3700 individuals currently holding the ATP credential and just under 100 individuals currently holding the SMS certification, the stakes have increased significantly and the complaints review process has become an active cornerstone of the credentialing process.

The promise of RESNA certification for the consumer is that those that achieve it maintain the highest level of professionalism through adherence with RESNA standards of practice (SOP) and RESNA's code of ethics (COE). The complaints policy, available on the RESNA website, is one way that RESNA ensure that promise. This policy, which incorporates the RESNA COE(RESNA, a) and SOP(RESNA, b), is provided to every certification candidate and is promoted and communicated to every ATP, SMS and Rehabilitation Engineering Technologist (RET) certificate holder. It allows the Complaints Review Committee (CRC), which resides under the PSB, to take action to protect the integrity of the certification process and the resulting credentials, up to and including revocation of the credentials. The purpose of this paper is to provide an overview of the role of professionalism and certification in the field of seating and mobility, with a focus on the complaints review process, which is administered by the RESNA PSB.

Professionalism is a critical component of all professions, but it is difficult to objectively define. Numerous professional organizations have examined professionalism and pre-service training (Brown & Ferrill, 2009; Costigan & Light, 2010; Hammer, 2000). Brown and Ferrill, in particular, define professionalism as “the attitudes, values and behaviors of a professional”(Brown & Ferrill, 2009). In order to define objectives that describe professionalism the authors created a taxonomic model of professionalism, which focuses on performance rather than identifying knowledge. This gets to the heart of the RESNA COE and SOP, as well as the role of certification, because they focus on the professionals' performance. The Professionalism Pyramid and Taxonomy of Professionalism developed by Brown and Ferrill are shown in Figure 1 and Table 1(Brown & Ferrill, 2009). The RESNA certification process focuses on the competence domain, while the re-certification process and the complaints review process focus on all three domains.

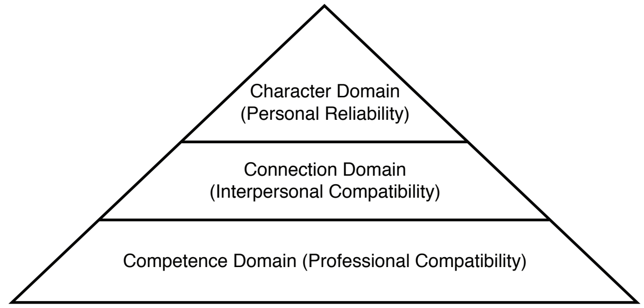

Figure 1. The Professionalism Pyramid(Brown & Ferrill, 2009)

Competence Domain	Connection Domain	Character Domain
1. Self-Directed Learning	1. Compassion	1. Honesty/Integrity
2. Knowledge	2. Empathy	2. Humility
3. Applied Skill	3. Self Control	3. Responsibility
4. Proactivity	4. Kindness	4. Service
5. Wisdom	5. Influence	5. Moral Courage

Table 1. The Taxonomy of Professionalism.(Brown & Ferrill, 2009)

The need to recognize professionals in any field is critical to elevating a profession among consumers, in this case individuals with disabilities, peers, employees and funding sources. One mechanism for professional recognition is the attainment of a professional certification. This comes with numerous benefits for all stakeholders, which range from personal satisfaction and advancement in the field for the professional, to increased credibility and a commitment to excellence for the employer(Clark, 2013; Diez, 2003; Knapp & Knapp, 2002). In terms of the RESNA certifications, which include the ATP, SMS and RET, this has been recognized as numerous consumers, professionals, professional organizations, employers, accrediting bodies, and funding sources identify individuals with these certifications.

The role of any credentialing body extends well beyond establishing the criteria for acquiring a certification. It also includes establishing guidelines for maintaining the certification(Conway & Cassel, 2012; Culley, Sun, Harman, & Warner, 2013). As the ATP and SMS certification have gained greater recognition, the recertification, reinstatement and adjudication of complaints against certificants has become even more important. The PSB and the CRC establish and implement the criteria that ensure all certificants abide by the RESNA COE and SOP. Though the PSB and CRC are critical to the recertification, reinstatement and adjudication processes, the most important stakeholders are the certificants themselves. Though any individual can file a formal complaint to the CRC, it is other certification holders who best understand the level of professionalism that is necessary to provide appropriate AT services to individuals with a disability. The COE and SOP define the level of professionalism that is expected by certificants, and therefore provides the metric in which all certificants are measured.

If an individual is not adhering to the COE and the SOP, then an individual can file a formal, written complaint to the CRC, with appropriate evidence of the allegation. The complaint cannot be anonymous. The complaint is then reviewed by the CRC, which includes gathering information from the complainant, the respondent, and any other associated parties. The CRC then levies a decision. The decisions range from providing a no-decision to putting a certificant on probation or revoking the certification. It is the responsibility of each certificant to abide by the COE and SOP, and to remain vigilant for infractions by other individuals in order to protect the public and the industry.

The RESNA certification program provides a mechanism for individuals within the field of assistive technology to demonstrate their knowledge, skills, experience and overall expertise. The foundation of the certification program is the RESNA COE and SOP. These provide the basis necessary in maintaining the high level of professionalism that is expected by stakeholders, which include the general public, members within the professional community, and funding sources. Given the expectation for a high level of professionalism, the CRC remains a critical component of the certification process set forth by RESNA, as the CRC continues to administer the adjudication process when certificants do not met the ideals set forth in the COE and SOP.

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Alternative Text

Figure 1. *The Professionalism Pyramid developed by Brown and Ferrill (2009). The pyramid depicts 3 levels. The top level includes the Character Domain (Personal Reliability), the middle level includes the Connection Domain (Interpersonal Reliability), and the bottom level of the pyramid includes the Competence Domain (Professional Capability).*

Table 1. *The Taxonomy of Professionalism developed by Brown and Ferrill (2009). The table has three columns and six rows. The table links directly to The Professionalism Pyramid depicted in Figure 1. The heading row lists the three domains, Competence, Connection and Character. The rows under the heading row list the elements of each domain. The relative importance of each element within each domain decreases from top to bottom. The elements of the Competence Domain are: 1) Self-Directed Learning, 2) Knowledge, 3) Applied Skill, 4) Proactivity, and 5) Wisdom. The elements of the Connection Domain are: 1) Compassion, 2) Empathy, 3) Self-Control, 4) Kindness, and 5) Influence. The elements of the Connection Domain are: 1) Honesty/Integrity, 2) Humility, 3) Responsibility, 4) Service, and 5) Moral Courage.*

IC71: Clinical Needs and Product Applications for Bariatric Clients of All Sizes

Ginger Walls, PT, MS, NCS, ATP/SMS
Jeff Cupps, ATP

Presentation Objectives:

1. Objective 1: Upon completion of this session, participants will be able to identify at least 5 clinical impairment and/or functional mobility limitations specific to the bariatric population.
2. Objective2: Upon completion of this session, participants will be able to identify at least 5 wheelchair and seating product features that are designed to meet the needs of bariatric clients.
3. Objective 3: Upon completion of this session, participants will be able to discuss clinical rationale for selection of seating and mobility product interventions for 5 different bariatric case scenerios.

Abstract

What does a 5'2", 190 pound client have in common with a 6'2," 450 pound client? Clinically bariatric clients who need complex rehab seating/mobility products have unique medical, functional, and envirnomental needs and challenges. The prevelence of the obesity epidemic in North America makes it essential for therapists, suppliers, and manufaturers of complex rehab equipment to be able to identify these needs and challenges and provide optimal product choices for clients of all sizes who are clinically obese. Synthsizing clinical rationale and product application expertise, providers and therapists must be able to skillfully apply clinical evaluation results to develop seating and mobility product/feature recommendations and justifciations for bariatric clients. Examples of individual client cases illustrate application of evidence based best practices to seating/mobility product application for bariatric clients.

Discussion

I. Impairments and Functional Limitations Specific to the Bariatric Population

- a. Defining obesity: Body Mass Index and Waist Circumference
  - i. Obesity: having a very high amount of body fat in relation to lean body mass, or Body Mass Index (BMI) of 30 kg/m2 or higher.
  - ii. BMI = Weight (kg)/Height (m)2
  - iii. Direct Relationship between Obesity and Co-morbidity, which leads to the reasons people need wheelchairs.
    1. Normal Risk Co-morbidity: 18.5 – 24.9 BMI; Waist <102 male; <88 female
    2. High Risk Co-morbidity: BMI 30-40; Waist >102 male; > 88 female
- b. Impairments of obesity: Coronary heart disease; Type II Diabetes; hypertension; pulmonary disease; stroke; cataracts; osteoarthritis; gout; skin changes, including chronic non-healing wounds due to pressure, stasis, or intertrigo; peripheral vascular disease; lymphedema; cancer; gallbladder disease
- c. Many of these impairments occur in combination and can lead to loss of mobility.

II. Evaluation

- a. Diagnosis, history, co-morbidities, surgeries, pain
- b. Height and weight – include changes
- c. Strength, endurance, sensation, skin, edema
- d. Postural and mat evaluation and measurements
  1. Special Measurements and Body Types
     - a. Anterior, posterior and lateral redundant tissue
     - b. Apple vs. Pear shapes
- e. Functional Status – Falls, Oxygen saturation, SOB, DOE, pain limitations, TUG Test, pressure relief ability, transfers, ambulation; MRADLs
  - i. Timed Up and Go Test (TUG) - Patient in sitting position is asked to stand and walk 10' (3 meters), turn and return to sitting. May use assistive device if needed.
    1. Normal healthy elderly usually complete the task in ten seconds or less.
    2. Cut-off Values Predictive of Falls
       - a. Community Dwelling Frail Older Adults:> 14 seconds associated with high fall risk
       - b. Post-op hip fracture patients at time of discharge:> 24 seconds predictive of falls within 6 months after hip fracture
       - c. Frail older adults:> 30 seconds predictive of requiring assistive device for ambulation and being dependent in ADLs
  - ii. Oxygen Saturation:
    1. Pulse Oximetry: Provides quick, objective measure to show blood oxygen saturation levels
       - a. Obtain resting pulse oximetry value
       - b. Repeat with w/c propulsion or attempts to ambulate
       - c. 95 – 100 % is considered normal
       - d. Below 90% is considered low; may also see SOB
- f. Specialty Evaluation: Required for Medicare patients who receive a Group 2 Single Power Option or Multiple Power Options PWC, any Group 3 or a push-rim activated power assist device; also a best practice for any patient with impairments causing mobility limitations.
- g. Home Eval and Accessibility
- h. Community Mobility and Transportation

III. Wheelchair and Product Features

- a. Power wheelchair drive configuration – FWD, MWD, RWD – consider foot position, as well as maneuverability
- b. Leg rests: swing away leg rests vs. platforms; power E/ALRs vs. foot platforms
- c. Power seat options: power tilt vs. recline or both
- d. Group 2 vs. Group 3 options; SP, MP; larger seat widths/depths, sometimes in combination with lower STFs

e. More Power!! Upgrading to next class in LCD option: “The patient’s weight is less than or equal to the weight capacity of the power wheelchair that is provided and greater than or equal to 95% of the weight capacity of the next lower weight class PWC – i.e., a Heavy Duty PWC is covered for a patient weighing 285 – 450 pounds; a Very Heavy Duty PWC is covered for a patient weighing 428 – 600 pounds; an Extra Heavy Duty PWC is covered for a patient weighing 570 pounds or more.
f. Armrest types – full vs. desk length; cantilever vs. dual/single post; armrest position and adjustment
g. Back Posts – endomorph (in set) vs. mesomorph (out set); Apple vs. Pear shapes
h. Adjustable axle plate – for center of gravity and propulsion biomechanics
i. Posterior gluteal shelf accommodation
j. Types of postural support/positioning options when needed
k. Cushion and back support types specific to intervention needed

IV. Case Studies to Illustrate Clinical Rationale for Selection of Various Seating/Mobility Product Interventions

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IC72: Custom Contoured Seating: Ensuring Successful Outcomes

Kelly G. Waugh, PT, MAPT, ATP

Disclosures: I, Kelly Waugh, do not have an affiliation (financial or otherwise) with an equipment, medical device or communications organization.

Custom contoured seating (CCS) is a generic, non product specific term indicating that seating support surfaces have been shaped to match the unique contours of the client's body. CCS is typically prescribed for individuals whose postural support needs cannot be addressed with less expensive, planar or generically contoured seating products.

Providing CCS for a client can be a labor intensive process, and therefore suppliers and clinicians have a desire to "get it right" the first time, with positive outcomes for the consumer. Therefore it is important to consider the factors that contribute to a successful outcome, and incorporate these into your process. Does one manufacturer's product ensure more successful results than another? No. I believe that there are numerous factors that affect outcomes, only one of which is an appropriate client-product match.

The following are eight critical factors that will help ensure a successful outcome with CCS. If any one of these process goals is not achieved, a less than optimal outcome can result.

1. CCS is indicated and appropriate for the client

2. A thorough clinical assessment prior to the shape capture has resulted in:

    - Prioritized goals
    - A "Postural Alignment Plan"
    - A shape capture plan

3. The features of the recommended CCS product match the unique characteristics and needs of the client

4. An appropriate wheelchair prescription which supports seating objectives

5. A successful shape capture:

    - Desired postural alignment achieved and maintained
    - Even, intimate contact achieved with molding medium

6. Accurate shape translation

7. Accurate fabrication – shape of product matches shape created during molding

8. Accurate integration of final CCS product into wheelchair base

IC73: Functional Mobility for Geriatric Population (The Meat and Potatoes)

Kathy Adkins, OTR/L
Leta Kant, PT
Judy Freyermuth, PT

Description

In this session clinicians will learn to identify common and potential issues related to seating and mobility that can affect functional mobility and independence. Clinicians will learn how to determine the appropriate solutions and interventions that can prevent future problems and injuries. Our goals as clinicians is to keep geriatric individuals maintaining quality of life and comfort during all aspects of their activities of daily living as well as preventing any future problems that can occur from using a wheelchair. As clinicians we need to be able to provide documentation that meets reimbursement for providing skilled and medically necessary services. In this session, you will learn how to document all aspects of therapy services that meet documentation requirements for all types of reimbursement.

Learning Objectives

1. Identify common and potential issues related to seating and mobility
2. Determine possible interventions and solutions
3. Proper documentation for skilled and medically necessity

Outline

I. Common and potential issues

1. Poor trunk control/stability
2. Spinal deformities
3. Pressure/skin issues
4. Contractures

II. Interventions

1. Must perform clinical mat assessment
2. Evaluate current seating system and determine why it is not appropriate
3. Determine root cause
   a. Contractures
   b. Spinal deformities
   c. Pressure/skin integrity
   d. Trunk stability
   e. Behavior
4. Problems/symptoms
   a. Contractures
      i. Increase joint flexibility
      ii. Decrease pain
      iii. Increase range of motion
      iv. Modalities
      v. Accommodate fixed components
      vii. Appropriate wheelchair (don't overcorrect by applying excessive equipment)
   b. Leaning (right/left/forward/backward)
      i. Must stabilize pelvis
      ii. Open back to seat angle
      iii. Appropriate seat depth/width
      iv. Determine appropriate cushion
      v. Correct foot height
      vi. Trunk supports
   c. Pressure/skin integrity
      i. Tilt/recline wheelchair-assess angles of wheelchair
      ii. Seat/depth/width of wheelchair
      iii. Stabilize/support pelvis
      iv. Integrity/type of wheelchair cushion
      v. Back Support
      vi. Upholstery of chair/cushion
   d. Behavior
      i. Rocking
      ii. Pain
      iii. Stress

II. Documentation

1. Thorough evaluation must be completed including
   a. Clinical mat assessment
   b. Current seating system/equipment
   c. Past medical history/diagnosis
   d. Social history
   e. Prior level of function
   f. Physical evaluation: ROM, muscle tone, skin integrity, sensation, activity tolerance, memory, cognition, activity tolerance, reflexes, motivation, postural alignment
2. Daily documentation must include:
   a. Specific joint measurements
   b. What skilled interventions trialed
   c. Hands on approaches-what worked and what didn't and reasons why it didn't work
   d. Length of time in wheelchair: pain, comfort, functional activities able to perform
   e. Training provided, who was trained and how they responded to training
3. Goals must be functional and measureable

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IC74: Kinesio® Tape: Case Studies for Use as a Dynamic Postural Support

Katherine Eingle, MOT, OTR/L
Erin Pope, PT, MPT

Introduction

For patients with complex neuromuscular conditions, providing stability has been the hallmark for seating and positioning. Dynamic positioning components offer many benefits including increased comfort and tolerance to seating, improved sensory processing and attention, and increased opportunity to engage in task specific learning. Kinesio® taping is a method of functional taping that has long been used in the orthopedic and athletic training fields. It may also be used for the complex neurologic patient to promote desired alignment for 24 hour positioning, inhibit destructive postures, and incorporate the benefits of dynamic supports into seating and positioning.

Learning Objectives

1. Identify three taping applications and implications for use in seating systems
2. Identify three benefits of dynamic versus rigid postural supports
3. Describe two uses of taping as a dynamic component in conjunction with a seating system

Population

Populations served by the Perlman Center, which may benefit from dynamic supports and taping: Cerebral palsy, Spinal muscle atrophy, Muscular dystrophy, Spinal cord injury, Spina bifida, Arthrogryposis, ALS, Head injury, CVA, and other neurologic and physical disabilities or conditions.

Seating and Positioning

Adaptive equipment that offers a stable base is critical for complex patients with neuromuscular conditions in order to actively participate in daily tasks. Currently, static supports and/or orthotics are often used to provide trunk stability as components of the seating system. While static supports maintain stability, they have a significant impact on movement and active participation during daily tasks. Static supports can limit movement and hold an individual in a single position. These supports also do not account for dystonia or extraneous movements. Decreased opportunities for movement often inhibit skills such as weight shifting and reaching, which are crucial for development of postural control.

Dynamic positioning components offer many benefits including increased comfort and tolerance to seating, increased chance for movement, improved sensory processing and attention, and increased opportunity to engage in task specific learning. This offers options for repeated practice of a task with controlled movement, thus gaining experience with active control of movement within the task. When this is incorporated into adaptive seating, the use of head or chest supports or more restrictive positioning components may decrease. This in turn allows the individual to have more opportunities for movement and to show progressive improvement in postural control.

What is Kinesiotaping

Kinesio® Taping is a method of functional taping which has a wide variety of applications including those designed to assist the body to hold a joint or position, increase proprioception and body awareness, and/or position a part of the body in better alignment. Kinesio® Tape is an elastic tape which has similar thickness and weight to skin, is designed to be breathable, is waterproof, can be worn for at least three to five days per application, and is designed to move with the wearer. The elasticity of the tape and ability to allow normal range of motion during wear is a significant contrast to other widely known taping methods, and can significantly impact a patient's tolerance for wear. This tape has long been used in the orthopedic and athletic training fields, to augment traditional treatment, with great success.

Assessment and Application as a Dynamic Positioning Component

While there are countless applications for specific patient needs, each application goes back to several basic concepts and specific corrective techniques. The properties of Kinesio® Tape have effects on five major physiological systems including skin, fascia, circulatory/lymphatic systems, muscles, and joints. When wearing Kinesio® Tape, the tape lifts the top layer of the skin, taking pressure off of deeper layers and structures. This, in turn, can lead to increased blood flow, increased lymphatic drainage, decreased edema and pain, and increased kinesthetic awareness. The main corrective techniques which are used as a foundation for any application include muscle facilitation, muscle inhibition, mechanical corrections, fascia corrections, space corrections, ligament/tendon corrections, functional corrections, and circulatory/lymphatic corrections.

In order to determine the most appropriate taping technique and application for a patient, the clinician must perform a thorough mat assessment, including evaluation of postural control, muscle tone, range of motion, and strength. This will aide in identifying the root of posture and positioning concerns is necessary. Guiding principles to consider during the mat assessment include Neuro-Developmental Treatment (NDT) concepts for movement and key points of control during therapeutic handling, the need for range of motion and mobility before strengthening, the necessity of proximal stability for distal mobility, and consideration for sensory processing and sensory thresholds. Following this initial assessment, a therapist trained in the Kinesio® Taping Method can then match an appropriate taping technique to simulate the therapist's intervention. Kinesio® Taping Techniques can be applied for a wide variety of patients and many therapeutic purposes including but not limited to muscle imbalance, postural insufficiency, circulatory and lymphatic conditions, ligament/tendon/joint injuries, fascial adhesions and scars, pathological movement patterns, and neurological conditions. Case studies will be presented on specific patients with complex neuromuscular conditions, to illustrate current positioning, presenting positioning concerns, and Kinesio® Taping applications trialed for use as a therapeutic support and component of the patient's seating system.

Biography

Katherine & Erin are lead therapists at the Perlman Center, part of the comprehensive Cerebral Palsy Program at Cincinnati Children's Hospital. The Perlman Center is a specialty center designed to address the complex therapy, developmental, assistive technology and care coordination needs of children, youth, and adults with cerebral palsy and other complex conditions.

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IC75: Service Dogs for People with Mobility Impairments

Kendra Betz, MSPT, ATP
Jennife Reneke

Learning Objectives

1. Participants will understand the specific support provided by a mobility dog for individuals with impaired mobility.
2. Participants will be able to outline the comprehensive client assessment relative to mobility dog considerations and referral recommendations.
3. Participants will be able to list and discuss three specific indications and three specific contraindications for provision of a mobility dog.
4. Participants will be aware of three additional resources for more information on the topic.

Abstract

Mobility Dogs (MD) represent one type of service dogs that are specifically trained to provide physical assistance to a person with a physical disability that impacts gait, balance, strength, dexterity or other musculoskeletal or neurological functioning associated with mobility. Professionals who support and provide assistive technology recommendations for people with impaired mobility have the fundamental knowledge and skills to serve as primary contributors to the assessment of specific patients to determine if a mobility dog is appropriate and fits within the client's rehabilitative plan of care. It is therefore critical that AT professionals and wheeled mobility specialists understand the potential support available from a mobility dog, the specific indications and contraindications for recommending a mobility dog, and the key considerations for use of a mobility dog as an adjunct to existing assistive technologies.

Session participants will gain the ability to evaluate a mobility impaired client relative to mobility dog considerations and will be able to determine if the client is appropriate for referral to an accredited service dog organization for further assessment. One highlight of the session will include an overview of service dog support available for Veterans served by the Veterans Health Administration based on federal legislation and national interdisciplinary collaboration to develop and implement the document, Clinical Practice Recommendation (CPR): Veteran Evaluation for Use of Guide Dog/Service Dog (GD/SD) in Plan of Care. Additional resources will be shared as well.

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IC76: Back It Up! Basics of Back Supports

Brenlee Mogul-Rotman, B.Sc.O.T., OT Reg. (Ont.), ATP

Body Orientation

- ABDuction
- ADDuction
- Superior
- Inferior
- Medial
- Lateral
- Distal
- Proximal
- Flexion
- Extension
- Rotation (internal and external)

The Pelvis

The position of the pelvis dictates one's alignment and ability to function in the seated position.

The Spine

Functions of the spine
- Protection of the spinal cord
- Provides for trunk mobility
- Connects the upper and lower extremities

Goals of a Solid Back Support System

- Provide trunk support
  Proximal balance and stability allows distal mobility and functional movement
- Support posterior pelvis
- Protect skin
- Allow horizontal gaze
- Support all functional activities - ADLs, mobility, rest

Pelvic/spine/head relationship

Remember,,,
- The sacrum connects to the spine at S1/L5
- The sacrum's position dictates the rest of the spine reaction
- The head is connected to and balances on top of the spine

'

Closed Kinematic Chain

Adjustments: What are they?
- Height
- Depth
- Angle
- Lateral supports

Back height
- Sitting balance, tone, posture, propulsion, type of wheelchair.
- Scapula(inferior angle of the scapula)

BUT....
- Do you have a gap lower down if you try and get the back to reach the scapula?
- What to do? How to decide?

Back Height

PSIS- Posterior Superior Iliac Spine
Key landmark when deciding where to mount the back support
Provides lower trunk control and control of the pelvis

If you need more height, then get a taller back support, don't mount it higher...

Depth
- Moving the back support forward or back will affect the seat depth
- Fwd=less seat depth. Backward=more seat depth

BUT...
- Does stability bar interfere?
- Is the cushion depth correct?
- Do the back canes now interfere with client's body?

Angle
- Angle can cause client to sit anterior, neutral or reclined.
- Open seat to back angle= recline
- Closed seat to back angle=anterior or forward

Pivot point is key:
- Do you lose PSIS contact?
- Is the pelvis(bum) pushed forward?
- Do the back canes get in the way of the body?

Lateral supports
- Symmetrical or asymmetrical placement?
- Upper or lower trunk support?
- How much depth to the laterals is needed?
- Swing away, fixed or built in to shape of back support

Functional Issues

- Hooking
- Lean to the side to reach
- Propulsion
- Transfers: can client transfer independently, can transfer board be inserted, can sling be inserted?
- Dressing/undressing
- Bladder care
- Transport in vehicle

It’s not all about the Back Support

Combination with cushion and secondary supports
Set up of mobility base:
- seat to back angle/back cane adjustability
- dump/seat to floor difference
- stabilizer bar
- push handles
- clothing guards/adductors

Armrests
Tray

Remember...

Back support is just one component of the overall seating system

Each client needs to be individually assessed

Various options are dependent on client physical, functional and personal needs

PS10.1: Review of Wheelchair Provision in the VA for Veterans with Amputations

Samuel L. Phillips, PhD, CP, FAAOP

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify three mobility needs of veterans with amputations when not using a prosthesis.
2. Identify three aspects of current wheelchair provision trends in the VA for veterans with amputations.
3. Describe population of veterans with amputations within the VA system.

This retrospective study of the VA database reviewed the provision of wheelchairs for veterans with amputations between fiscal year 2004 – 2010. Data was pulled from the inpatient (PTF) or surgeries file. The purpose of this data pull was to identify all VA patients who had received lower extremity amputation surgery. Patient files with the following surgical codes: 84.10-84.19 (lower extremity amputations, all) which were found in any of the 1st through 5th surgical code positions for data from FY 04-10. An Excel file was generated through the VSSC create your own report function. Output included patient identifiers (SCRSSN), date of surgery, station information and surgical codes. This does not include amputations performed outside of the VA system including private hospitals or military hospitals. This cohort was then cross-referenced with the national prosthetics patient database, which tracks the provision of both prosthetic devices and wheelchairs. The results showed a surprising number of depot chairs are prescribed to veterans with amputations. The preliminary results indicate there may be an opportunity to improve mobility care for veterans with amputations when they are not using their prosthesis.

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PS10.2: Beyond the "Support Group": Empowering People with SCI Through Networking.

Bryan McCormick, M.S.

Learning Objectives

At the conclusion of this workshop, participants will be able to:

1. Identify the needs and skills required by some individuals with SCIs to fully participate in a community.
2. Encourage the developement of peer networking opportunities as a means to educate and connect those with SCIs.
3. Encourage the use of social media as a means to educate and connect individuals with SCIs.

After individuals acquire spinal-cord injuries, there is often the potential for some of those individuals to experience a lower quality of life, simply because they are not cognizant of their potential. Many of those with SCIs cease to learn necessary skills after inpatient rehabilitation and do not possess requisite skills that would enable them to fully access their communities. But by providing networking opportunities for those with SCIs, it is possible to help individuals reach their full potential by providing education, mentorship, and counseling. What's more, with social media, these services can be provided to those who may not be able to meet in a traditional networking setting.

PS10.3: Measuring Posture: Initial Validity and Reliability Testing of the Seated Posture Scale

Lelia Barks, PhD, ARNP
Gail Powell-Cope, PhD, ARNP
Stephen Luther, PhD
Brian Schulz, PhD
Lisa Brown, PhD
Elizabeth Bowen, PhD

Background

Over 70% of nursing home residents currently use a wheelchair (Brechtelsbauer & Louie, 1999) and evidence is compelling that many wheelchairs available to these residents are inadequate (Hubbard, et al, 2004; Wick & Zanni, 2007; Fuchs & Gromak, 2003). Evidence shows that health outcomes such as breathing and eating are direct outcomes of posture (Lin, Parthasarathy, Taylor, Pucci, Hendrix, & Makhsous, 2006; McFarland, Lund, & Gagner, 1994; Nwaobi & Smith, 1986; Logemann, Kahrilas, Kobara, & Vakil, 1989), which is an outcome of repositioning or positioning, often upright in wheelchairs. Despite proliferation of wheelchair design technology, and except for interface pressure and pressure ulcer development, little is known about effects of wheelchair positioning on health outcomes (Sprigle, Harris and Davis, 2007), and intervention research in this area is scarce (Trefler, et al., 2004). Most studies have focused on wheelchair design, function within the environment, and safety. Particularly for older adults, inadequate or inappropriate wheelchairs are associated with lack of awareness and knowledge about seating and positioning needs. Caregivers who position older adults in wheelchairs must therefore rely on scant evidence to inform their task (Gavin-Dreschnack & Barks, 2008).

The purpose of this study was to develop a reliable and valid, low-burden instrument to measure intrinsic seated posture of older veterans, to allow future study of health outcomes of seated positioning interventions. The study quantified muscle tone as a potential influencer of posture in this group

The specific aims of this study were to: 1) evaluate validity of a newly developed instrument (the Seated Posture Scale) to measure seated posture in wheelchairs, including content validity, and construct validity, 2) evaluate internal consistency reliability and test-retest reliability of the instrument, 3) quantify muscle tone in a sample of older veterans in wheelchairs, using the Modified Ashworth Scale, and 4) quantify posture in a sample of older adults, including some with dementia, using the new tool.

Methods

Participants: After obtaining institutional Review Board approval, we engaged six wheelchair seating experts as an expert panel to review content validity of items of the instrument and usage instructions. We recruited a convenience sample of 48 Veterans (>63 years old, use a manual or power wheelchair or scooter ≥ 6 hours/day, no amputees.) We used an opt-out procedure allowing them to elect not to be contacted.

Instruments: The Seated Posture Scale (SPS) is a 23-item, paper-and-pencil summative scale measuring the concept of wheelchair seated posture of adults, with either a 1 indicating an anatomical segment aligned in wheelchair seated position, or a 0, indicating nonalignment of the segment. A perfect score is 23. It is based on the Seated Postural Control Measure for Adults.

We seated Veterans in a Prairie Reflection PSS98 Planar Simulator, on a standard 2-inch foam pressure relief cushion, to uniformly administer the same seating conditions to participants with varying body sizes.

Procedure: In order to evaluate test-retest reliability, seven different postures of three mannequins in wheelchairs were scored twice in succession on the provisional scale by three clinicians and the PI for a total of 42 trials per rater, with the PI serving as an expert rater and an interval of 2 minutes out of the room between trials.

After consenting the Veterans, we configured the simulator at 105 degrees seat to back angle, 90 degrees knee flexion angle, and 90 degrees footrest angle. We placed armrests at a height sufficient to allow a 90 degree elbow flexion angle without shoulder protraction or elevation. The seat depth was set at the same length as the longest thigh length. With participants seated in the simulator, we collected demographic, Barthel index (function), Visual Descriptor Scale (VDS, pain intensity in non-malignant pain), Modified Ashworth Scale (MAS, muscle tone) and SPS (posture) data. Muscle tone was scored in seated position with values at right and left shoulder, elbow, hip and knee. A value was assigned for each range of motion at each joint, recording only the highest of these values for each joint, then summing all eight values to give a total score on muscle tone. Then item by item, we scored the SPS items. A single data collector was responsible for all data collection.

Data analysis

The data were analyzed using SAS version 9.2. Descriptive statistics were calculated to determine frequencies of age, gender, race/ethnicity, co-morbidities, and scores on Barthel Index, Visual Descriptor Scale (VDS), and Modified Ashworth Scale (MAS). Internal consistency reliability of the scale was examined using Cronbach's alpha, which represents the extent to which item responses correlate with each other and with the total scale score. To evaluate test-retest reliability using mannequins to score posture, we correlated the scores from two different time-points on first the SPS individual items and then the summative scores, for each of four raters. Content validity was evaluated by averaging the six scores from the expert reviewers for each individual item and then averaging these 23 values to develop an overall scale Content Validity Index (S-CVI).

Values on variables thought to be associated with posture (physical function (Barthel Index), pain (VDS), and muscle tone (MAS)) were compared to the total SPS score using Pearson's product moment correlations coefficient to provide support for preliminary construct validity of the scale.

Results

- The scale achieved very good content validity (S-CVI) of 0.744.
- Preliminary construct validity of the SPS was supported with the Barthel score being positively associated with the SPS score, $r = 0.22$ ($p=0.0007$) and the MAS being negatively associated, with $r = -0.20$ ($p = 0.0014$). The VDS was not found to be associated with the SPS score, $r = 0.05$ ($p = 0.12$)
- Internal consistency of older Veteran participants' values on the total SPS score achieved a Cronbach's alpha value of 0.66. Test-retest reliability using mannequins in wheelchairs yielded Pearson Product-Moment correlations ranging from 0.89 to 0.99 across four raters.

Conclusions

This descriptive study used an iterative method to evaluate validity and reliability of a measure of seated posture (Seated Posture Scale, SPS) in older adults who use wheelchairs for seating and mobility. Support for content validity of the SPS was provided through review by six experts in the field. The total SPS score for the Veterans in the study correlated positively with the Barthel Index ($r = 0.22$, $p=0.0007$) and negatively with the MAS ($r = -0.20$, $p = 0.0014$) supporting the construct validity of the SPS. Internal consistency on the SPS score was 0.66, based on Cronbach's alpha. Test-retest reliability using mannequins in wheelchairs yielded Pearson Product-Moment correlations ranging from 0.89 to 0.99 across four raters. These results provide strong support for the validity and reliability of the SPS. Research is ongoing to further refine the SPS.

PS10.4: Predictors of Falls from Wheelchairs

Shirley Groer, PhD

This material is based upon work supported by the Office of Research and Development, Department of Veterans Affairs. VA HSRD IIR #003-03-03 & VA RR&D #E4460R. The views expressed in this article are those of the authors and do not necessarily represent the views of the Veterans Health Administration or the Department of Veterans Affairs. Also would like to thank the research teams from both studies.

When someone falls, the result may impact quality of life. An injury sustained from that fall may result in long term disability, increase of a chronic illness or even death. Frail elderly and persons with disabilities are particularly vulnerable. Although a great deal of work has been completed on the ambulatory population with respect to falls, typical risk factors, such as gait, are not applicable in populations that use wheelchairs. Limited research has been completed that examines the mechanism and resultant risk factors for individuals who use wheelchairs. The yearly incidence of serious wheelchair related accidents ranges from 1% to 17.7%.1,2,3 Another study reported that an average of 50,000 wheelchair related accidents occur which demand medical attention in the form of an emergency room visit.4

In order to examine wheelchair studies more fully, two longitudinal studies were completed which examined risk factors associated with falls from wheelchairs. Study one used Veterans who had a Spinal Cord Injury (SCI) and used a wheelchair for their primary means of mobility. Study two used Veterans over the age of 65 who used a wheelchair for their primary means of mobility. Both studies used a similar protocol – all Veterans, once recruited were followed for a year. Each participant was called monthly to query whether a fall had occurred. Additional information such as co morbid health conditions, wheelchair characteristics, and wheelchair skills as assessed by the Wheelchair Skills Program 5 were also collected. From the information collected, incident rates were calculated for those who fell and fell with an injury. Risk factors were determined. For the SCI wheelchair fall study, a risk assessment tool was then developed and validated.

In the SCI wheelchair fall study, 702 Veterans participated. In the Older Veterans wheelchair fall study, 757 participated. In both studies the population was predominantly male. Thirty one percent of the Veterans in the SCI wheelchair fall study fell, with 14% reporting an injury. In the older Veteran wheelchair study, 21% fell with 15% reporting an injury. Wheelchair skills scores were 85 +/- 22 for the Veterans with SCI. For older Veterans, the wheelchair skills score was 63 +/- 22. Although many variables showed risk to falls, when data was analyzed in a predictive regression model risk factors were different for the two groups. For the SCI wheelchair falls study, risk factors included pain in previous two months, higher FIM sub motor score, fewer years since SCI occurrence, shorter length of wheelchair, alcohol use, and self-report of fall in the previous year.6 For the Older Veteran wheelchair fall study, risk factors included energy levels, health status, not using brakes on wheelchair, not using pelvic belts, and pain in transfers. Types of injuries sustained include cuts, bruises, and head trauma. A fall risk assessment tool has subsequently been developed for use in Veterans who have a SCI and use wheelchairs. The five item tool has shown high reliability (96%).

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